# Paper Is Too Cheap

THE year 1937 will go down in the records as a most erratic year so far as the general business volume figures are concerned, for the volume reached a high of 81 per cent of normal in the spring, leveled off at about 80 per cent, was 79 per cent until the opening of the last quarter and then took the most precipitate decline in history, making a low of 62 per cent of normal in the latter part of December. Eighty-one per cent of normal was the uttermost high since the Great Depression and 62 per cent was the low of 1935. Therefore, in December, we had lost in three short months all of the gains of the three years of 1935, 1936 and 1937.

Only in the minds of the politically elect in Washington, is there any disinclination to admit the causes for the Roosevelt depression. The country at large understands and appraises the real reasons for the collapse of the business balloon.

Be that as it may, and there is no power on earth that can change this fact, while general business did a tail spin, the paper industry made a fine upswing and gave handsome account of its operations, of which, every member of the industry may be proud.

On December 5, Dun and Bradstreet made public the figures of their annual survey of the paper industry, which showed that paper production made another peak year and registered a 5 per cent advance over 1936, the previous all-time peak year record.

For 1937, the survey says that 12,575,000 tons of classified paper products were produced as against 11,975,552 tons for the year, 1936.

The extraordinary demand for pulp and paper products is due for further continuous expansion. There is no denying the facts. The facts are that the raw materials of the paper industry,—wood pulp and pulpwood, enjoy the most diversified demand as basic raw material from which to make the tremendous number of other commodities, which formerly used other materials as a base, because pulps and paper are the cheapest and most efficient raw materials on earth today.

In 1933, No. 1 domestic spruce pulp was sold at less than one cent a pound; foreign unbleached sulphate pulp sold at 1¼ cents a pound; and No. 1 bleached sulphite pulp sold in a range from 1½ cents to 2 cents a pound.

In 1932, the total pulp production of the world was 15,645,000 tons. Since then, it has made a phenomenal, almost perpendicular, rise to 23,189,000 tons at the close of 1936—and the 5 per cent increase of 1937 will add another 1,200,000 tons to the 1936 total.

Today, January 1, 1938, the country faces a world-wide curtailment of wood pulp and pulpwood supplies.

So, the nub of the situation is just this—the consumers of pulp and paper mill products are faced with a continuous increasing world-wide demand on the one hand and a constant contraction of supplies on the other.

Moreover, the consumers of paper are faced with the bitterest competition in history. Industries like rayon, cellophane, film, resin, the textile, box and lastly, the board and lumber industries are turning to the pulp digesters for their raw materials. Every ton of pulp now taken by those, and literally countless other minor industries, is just so much tonnage diverted from the paper consumer. And this competition will continue and the diversion will last until the price of paper advances sufficiently to command the return of the pulp for paper consumption. For be it known—paper is too low in price.

# + EDITORIAL +

This is the underlying reason why the paper and pulp markets have held so relatively strong in the face of and through the recent drastic decline of general business volume.

It is well to remember that when the general business volume reached 81 per cent, as it did last spring, the demand for paper exceeded any previous period on record and many of the divisions of the industry made 100 per cent of capacity operations for months. In view of that situation, what will happen when the general business volume gets back to 100 per cent of normal, as it most certainly will?

The paper industry is the essential industry of the world. The per capita consumption in 1936 was 226 pounds per annum—only exceeded by water, first and milk, second.

The world must have paper, otherwise commerce and industry cease.

## A Square Deal

IT WAS vacation time. One of the old employees, scheduled for vacation starting the next morning, had just received his pay. This pay not only covered that which was due for services actually performed but also for the two weeks he was to be away.

With this money in his pockets and just five minutes before his very punctual boss was to close his desk for the day, a habit with which the old employee was very familiar, he called upon the boss in his office not to say, "Au Revoir," or some other pleasantry before departure, but rather bluntly to inform him that he was through and would not be back. Of course, the news came to the boss as a bolt of lightning from the sky, as neither by word nor action had the employee indicated he was dissatisfied. Then, too, it was assumed that any employee benefiting from the vacation policy of the employer, would be back on the job after vacation.

The boss, after recovering from the shock, made inquiry if the decision was final. The employee said that it was—that he was going into new work where his abilities would be appreciated and where he would have opportunity for advancement and for making money. None of these things, he said, had been offered him during all of the years by the employer he was quitting.

The boss wanted to be fair—fair both to employer and employee alike. Therefore, after listening to the recital, he did not wish to change the decision of the old employee about leaving, but rather to straighten out some of his warped ideas.

So before the incident was closed, before the old employee left for his greener pasture (which, by the way, failed to materialize) the boss unfolded some of the good things which the employee had enjoyed during his long association with the concern and which had been overlooked by him.

Never had the employee missed a pay day. His wages were always ready when due. There were vacations with pay. An opportunity for promotion also was presented him a few years before, but because it entailed a new line of work, he turned it down. There also was the loan that the employer had made him to straighten out a mortgage difficulty on his home, for which two years were allowed him to pay it back and this without interest.

To each of these comments there was no denial; but was not each one of them something for which appreciation to the employer was due?

Most certainly, there had been social security; the opportunity to grow and expand; and the sympathetic hand in time of need.

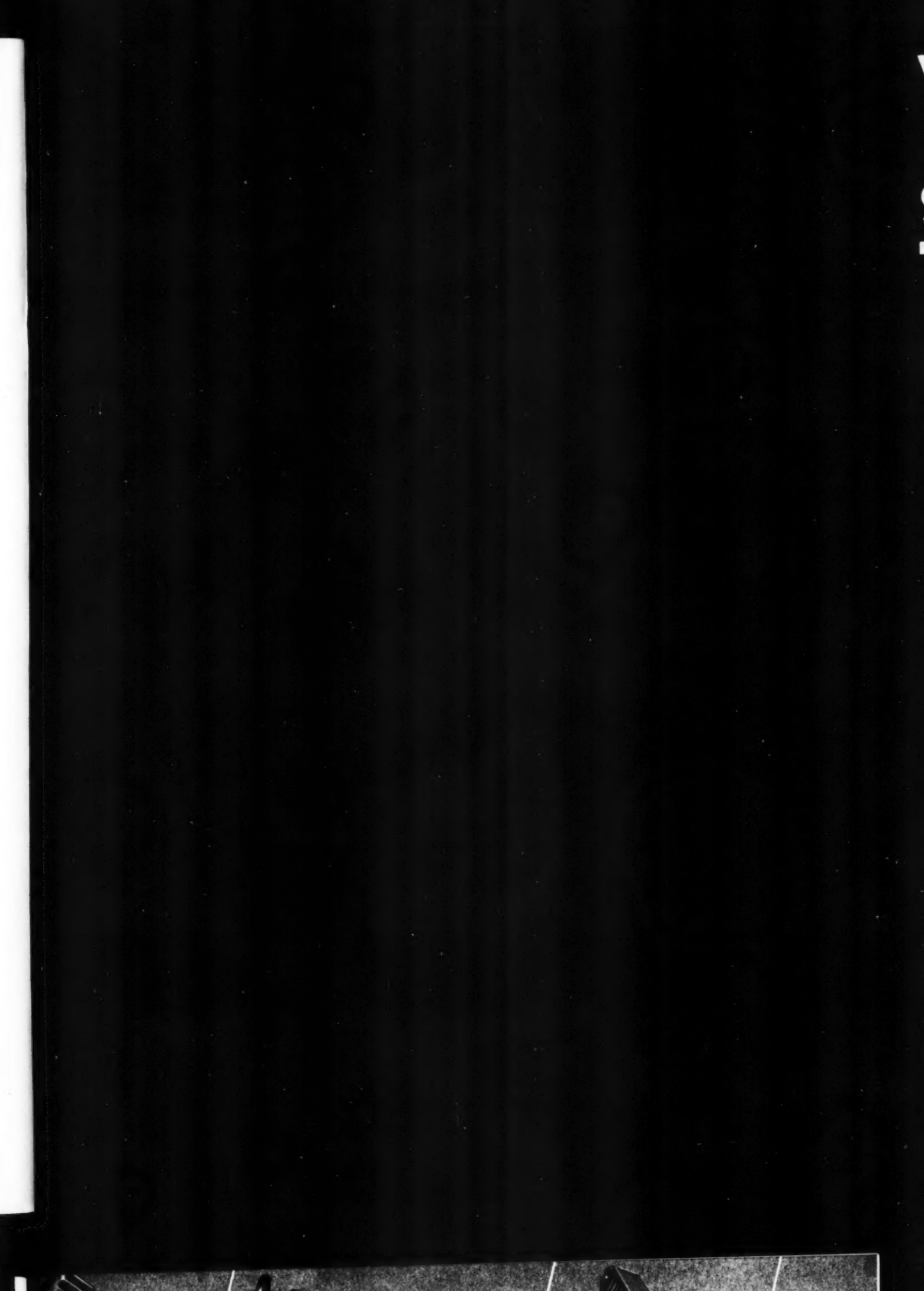
Doesn't it look as if the lack of appreciation in this case was on the part of the employee rather than the employer? However you decide, may the recital of this individual experience stimulate you at the beginning of this New Year to a fuller realization of the need for appreciation in this scheme of things for the other fellow and may it in some way aid him in getting a square deal.

## Remember the Annual Meetings

IN another few weeks, the Waldorf-Astoria Hotel in New York will be the Mecca of pulp and paper makers from all over the United States. Presidents, vice-presidents and other officials of many of the leading mills of the industry will assemble there for the 61st Annual Convention of the American Paper and Pulp Association. Chemists, chemical engineers, engineers and technologists also will be there for the twenty-third annual meeting of the Technical Association of the Pulp and Paper Industry. Both meetings are scheduled for the week of February 21, the TAPPI meeting being concluded on the 24th and that of APPA on the following day.

The importance of these meetings cannot be stressed too much. They represent the most important annual gathering of the industry. Any one interested in getting the pulse of the industry, in meeting outstanding men of the industry, or in becoming more familiar with its economic and technological aspects should make plans to attend these sessions.

Do not forget the time or place—the week of February 21 at the Waldorf-Astoria in New York.



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# CURRENT THOUGHT

## Retrospection and Introspection

WILLIAM SIBLEY

♦ THE YEAR 1937 IS HISTORY. A new year is ahead—1938 is ahead—to do with, to make of, to get from, as we will. What 1938 will mean to each of us depends on each of us. There is small point in looking backwards save that in history there frequently lies lessons and pointings of a better way.

For instance: very recently the National Safety Council released the terrifying fact that our most universally accepted mode of transportation, the automobile, has killed approximately 40,000 people this past year. That is a figure larger than the entire town of Le Mars, Iowa, than the number ever before killed in any one year. It is one-sixth the number of soldiers killed during the entire World War. It is perfectly frightful. And all the more so because a great many of those automobile deaths were entirely needless. Needless not in the sense that those deaths were caused by the absence of quick wit, lack of training, or personal misjudgment. But needless in the sense that many deaths were caused by dare-devil, chance-taking drivers—the dare-deviltry in whom might easily be eliminated by more stringent laws. Let every automobile driver know that if he hits any person, for whatever cause and however hard, he instantly will be deprived of his driving license for a period of six months; that the second offense means a jail sentence and a year's forfeit of driving license; that the third offense means state confiscation of his car and a five-year forfeit of driving privileges—there would be fewer accidents. Let drivers know that for infractions of traffic rules (which should be, and must eventually be, universal throughout the nation) there are jail sentences of anywhere from three-days to three-years, and there will be fewer traffic laws broken. Money is too cheap in this country for car owners. It is too easy to pay a fine; then to get back in the car and "drive" home. It is too easy to "fix" aldermen, policemen, judges. The consideration of money loss will never stop our motor massacre. But jail sentences and deprivation of driving licenses will. . . . We'll all find that out someday—I hope soon.

♦ THE FIFTH YEAR OF REPEAL finds increasingly large stocks of liquor in the bonded warehouses ageing for consumption. Up to a point of age the making of liquor is a profitable business. Distillers can produce a gallon of raw whiskey for about 48 to 55 cents. Huge forty-eight gallon barrels cost about $10.00 each, so that the cost of making and stocking whiskey is not excessive—particularly when the by-products of the raw materials entering into its manufacture can go far toward paying the original manufacturing cost. Of course there is a huge interest payment to meet on tied-up investment as the whiskey is ageing. But, up to a certain number of years, the value of the ageing whiskey rises faster than the interest on investment subtracts from it.

Why is whiskey being made much faster than consumption demands? Well, I have given one answer—that of financial profit from sheer age. There is also a second reason, that being that many of the far-sighted distillers see in the future a return to some sort of prohibition. And they would like to be well fortified with stocks on hand when such time comes. There is too much unevenness in liquor legality. In some states, like Kansas, the commonwealths are supposed to be totally dry, save perhaps for weak beer. In other states, like Illinois, liquor is sold anywhere the retailer can afford to pay the purveyor's license. Drug stores, delicatessens, grocery stores, meat markets, taverns, straight out-and-out liquor stores—all sell liquor to all comers of whatever age or sex. Neither condition is right. Which condition is the better is a matter of personal opinion. But since neither is right, some alteration in the present-day scheme of things must, of necessity, come. And that's the second reason why whiskey is being distilled much faster than it can be consumed.

♦ ANOTHER INTERESTING SIDE OF THE 1938 PICTURE is the fact that many industries are co-operatively seeking new markets for their product. The paper industry should do more of that work. A case in point:

That industry which produces porcelain enamel has recently collected funds from the membership of the industry and co-operatively sponsored a research "division"—its sole purpose being to find new ways in which to use porcelain enamel. It is already being used for countless things little known to the public, such as railway passenger-car sheathing (in foreign countries), pump impellers, automobile engine manifolds, cinder catcher plates, coal chutes, clothes chutes, etc. Of greater interest are some of the wide-open markets this research committee has uncovered for porcelain enamel. They found that practically all the ships on the high seas used cast brass portholes. The corrosion problem forced the shipbuilders to use brass—and cast brass was the cheapest form. But why not porcelain enamel? It was far cheaper, easier to clean, endlessly durable, absolutely impervious to corrosion. So—well—there is a new market for porcelain enamel. And just try to count the portholes on the Atlantic Ocean alone! Automobile wheels, railroad signal equipment, trackless trolleys, transformer cases, tanning vats, sub-stations for electric utilities, preheaters and heat exchangers for the oil industry, linings for solvent degreasing equipment—these are just a few of the things to which porcelain enamel might well be applied.

As I said, the paper industry should do more about this matter of research.

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# Metallic Dendrites in Paper

MURRAY M. RUBIN and WALTER R. RUBIN

DENDRITES are characteristic arborescent structures well known to metallographers, especially in the field of non-ferrous metals and alloys. They may be described as crystalline skeleton growths observed invariably in cast alloys which have not been annealed or otherwise physically treated. In large bronze castings they frequently cause metallic "stars" and these give trouble in the machining operations. The grains in such metallic materials may differ with the metal composition and treatment, and their sizes have been reported to vary in diameter from .0025 to 25. mm.

Such metallic dendritic growths have been noted in rag, grass fiber and chemical wood pulp papers for fine writing, printing, book and bond grades for many years. Their occurrence and significance have always been more or less of a mystery to paper manufacturers. Their presence in papers made in England has been reported as far back as 1872*(1)*; Herzberg*(2)* makes brief note of these in "Papier prüfung", but any literature on this subject in North America and explanation of speck growths*(3)* in paper due to influence of materials of construction and maintenance on finished paper quality has been conspicuous by its absence. Many printers, pulp and paper mill technologists and plant operating superintendents in the United States and Canada who have seen such pine-tree shaped specks in paper or examined the samples shown with this report have mistaken them for some type of slime or mold growths. Their resemblance to some microbiological forms, such as Crenothrix polyspora (Figure 1) is marked, but the latter are organic vegetable growths formed by the germination of conidia which are visible in such plant threads at high magnification under the microscope. Perhaps the most interesting and peculiar thing about this type of foreign particle in fine papers is the fact that it is rarely found in the paper directly after manufacture, but develops in the finished product several days, weeks, or even months afterwards. Finished and carefully inspected fine papers free from any visible dirt content or flaws at the mill may develop in storage as many as 250 such black dendrites of several millimeters diameter on each folio sheet!

**Photomicrograph Equipment and Methods**

Photography of specimens observed with a simple microscope is a branch of paper technology which is growing rapidly in importance, value and popularity. Photo-microscopy is actually a much more simple, easy and practical subject for use for technical records than might be expected. The equipment (Figure 2) used in making the photomicrographs for this study (Figures 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14) consisted of a box-type plate holder camera with photographic shutter for time and bulb exposures. With the frontal rectilinear lens removed from the camera, it was mounted above the microscope eyepiece and a light-proof sleeve attached as shown to exclude external stray rays of light between microscope eyepiece and camera. Eyepiece magnifications of X6 and X10, and objective X10 were used. The objective light source is important, but a 60 watt mazda bulb in a desk lamp reflector provided good illumination. A shaving mirror mounted above the camera served to view on the ground glass focusing screen any images before exposure to photo-gelatin coated glass plates. The whole set-up was placed on sponge rubber pads to absorb any vibrations which would result in certain failure for long time exposures of 20-25 secs. with transmitted light with this apparatus. A small magnifying lens of magnification X7½ and mounted on a

Fig. 1—An organic vegetable growth (Crenothrix polyspora) which resembles a metallic dendrite

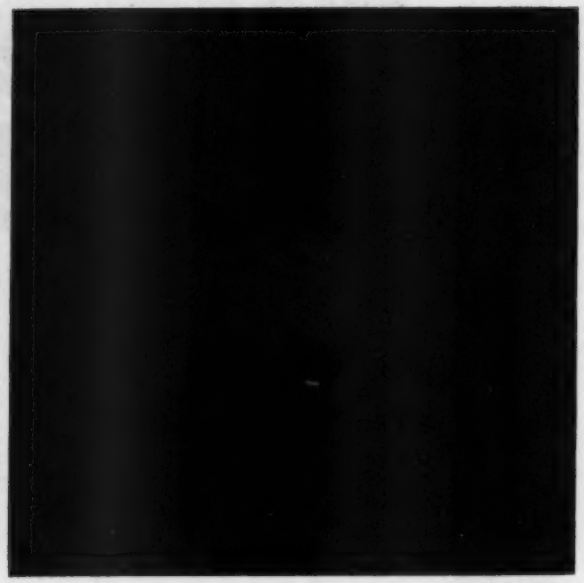

Fig. 3—Clean surface of a high finish sulphite cellulose book paper; reflected light, magnification X2.8 diameters

tripod was substituted for the microscope in taking the photos at low magnification and reflected light of paper surfaces shown. In general, anything observed through the microscope may be photographed through it, but each subject presents an individual problem in exposure, choice of filter and film.

The equipment and method described is only one of several that might be used for photomicrography. With the recent Eastman Microdak outfit the camera takes roll film, no dark room is required for either loading or developing the film, and anyone with a casual knowledge of photography can attach this special camera in a few minutes to the microscope ocular and obtain fine results without the limitation of high cost or necessity of extensive training. High grade photomicrographic equipment ranging in cost from a few hundred to thousands of dollars are in use in industrial and research laboratories, but such simple apparatus as shown in Figure 2 and including a polarizing microscope can be purchased new and by any plant laboratory for less than fifty dollars.

## Micro-chemical Technique

The value of indicator organisms in differential analysis is well known to bacteriologists, but due to the nature and minute amount of material available usually for examination, the exact systematic analysis*(4)* and qualitative and quantitative classification of specks

Fig. 2—Photomicrographic equipment need not be extensive

Fig. 4—Flake of bronze embedded in sulphite printing paper; R.L. X2.8 d. Actual diameter of flake in the paper, 1.75 mm.

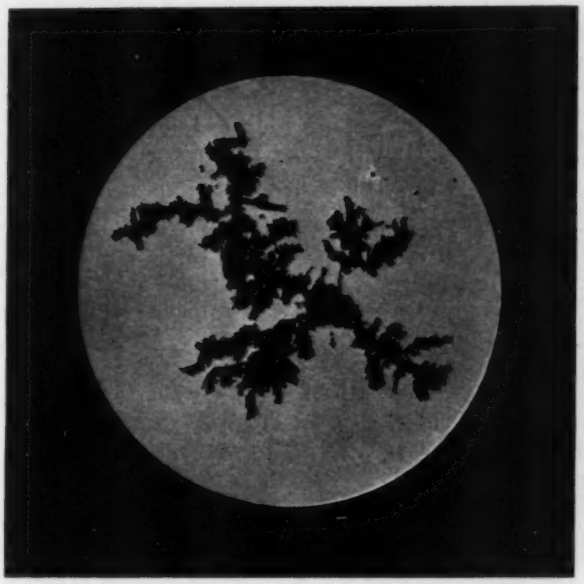

Fig. 5—Dendrite in 100 per cent rag paper, showing metallic bronze nucleus; R.L. X20 d.

Fig. 7—Dendrite in Fig. 6; transmitted light X20 d.

and small particles of foreign materials in fine papers is a difficult problem. Samples are examined ordinarily with the naked eye, a magnifying glass, and microscopically by transmitted and reflected light first. This may be followed by treatment or extractions with water, organic solvents, chemical vapors or special stains. Indicators, acids, alkalies, oxidizing and reducing solutions also may be required before identification. Rapid and successful results depend much on the background of individual experience and judgment of the analyst. Time is at a premium in such tests in a mill and the determination of the nature and origin of objectionable foreign matter in pulp or paper being manufactured enables the plant operators to eliminate the difficulty immediately and may result in savings of thousands of dollars in rejected unsalable product. The importance of micro-chemistry as a new tool in dealing with such problems is apparent also from the fact that the Nobel prize in organic chemistry was awarded in 1923 to Pregl in Austria for development of this branch of the science.

In general, with the exception of aluminum from paint used on beater bars the only metallic particles found in pulp or paper consist of iron, steel, or copper. The quickest method of differentiating these is to carefully remove the speck with a needle and use of a small magnet. Iron or iron bearing particles are attracted by the magnet. Such specks may be further

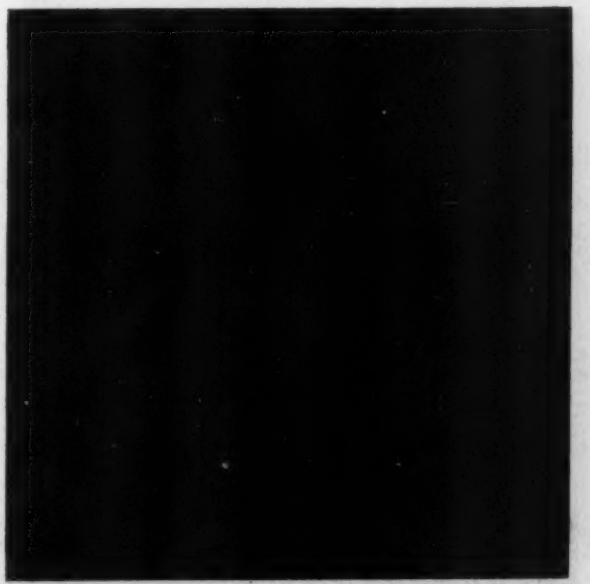

Fig. 6—Dendritic speck in rag and sulphite content W.M. Bond paper; R.L. X2.5 d. Actual diameter of speck in paper, .5 mm. The specimen is known to be 10 years old

Fig. 8—Dendrite in Fig. 6; transmitted light X30 d. Note the ring structure of the dendrite in Figs. 6, 7, 8. This concentric appearance is characteristic of iron oxide and old bronze dendrites

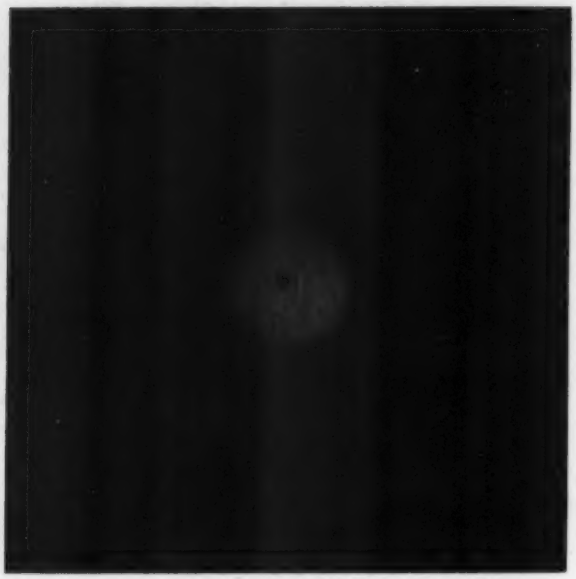

Fig. 9—Dendrite in 100 per cent coniferous sulphite Bond paper; R.L. X2.6 d. Actual diameter of speck in paper, 1.25 mm.

tested chemically by treatment with dilute hydrochloric acid on a filter paper, and then addition of a drop of potassium ferrocyanide or thiocyanate solution. Iron salts turn blue with the former and red with the latter. If iron is absent, the copper speck can be dissolved in a dilute solution of nitric acid with which it yields a green solution of copper nitrate. The green turns a deep blue on addition of ammonia. By microchemical methods, .002 mg. of copper may be identified easily by this reaction. Acid resistant bronzes such as are now being used in pulp and paper mills and which contain a few per cent of zinc and sometimes tin, yield black dendritic specks of copper oxide and sulphide in some papers (Figure 11) that are resistant to solution even in concentrated nitric acid. In bronze specks dissolving in nitric acid, .1 per cent of zinc may be identified by addition of a dilute solution of potassium ferricyanide. The yellow quadratic crystals of zinc ferricyanide can be recognized at a magnification of 400. Zinc may be driven out of such alloys also as the oxide by volatilization and sublimation in an infusible capillary and then converted to colorless tetrahedra of sodium zinc carbonate. Such procedures enable the micro-analyst not only to test dendrites, but also determine any premature failure of acid resistant mill equipment and fittings.

The formation of copper oxide or sulphides in bronze dendrites in paper results from a process of oxidation from the presence of air and moisture or from traces of active sulphides formed in the paper by interaction of alum and sulphur bearing compounds. These may find their way into the pulp or paper with the water, sulphite cooking acid residues, antichlor, hydrosulphite bleaching materials, ultramarine blue or thiazine paper dyestuffs in coloring or even lithopone or zinc sulphide*(5)* base fillers used in the various steps in the process of pulp or paper manufacture. Vapors and gases may even be sorbed by cellulose from the air to assist in formation of a dendritic growth from a bronze flake. By such a process cotton at ordinary temperature and atmospheric pressure will sorb 5 per cent and wood 13.6 per cent of $SO_2$. The source of minute amounts of active sulphur in papers frequently puzzles many paper mill technologists, yet the pulp and paper industries alone account for more than 15 per cent of the total sulphur consumption in North America.

In the TAPPI standard test method for reducible sulphur*(14)* in paper (T-406m) we have a method of detecting distinctly .0001 per cent sulphur in pulp or paper. In all samples we have examined which showed dendritic growths we have always found the paper to give a distinct positive test for sulphur by this method and the pH of the paper to range between 4.0 and 5.0. Another simple method of demonstrating the presence of copper sulphide in dendrites is by application of a fresh solution of KCN or $K_2Cd\ (CN)_4$. KCN will dissolve such dendrites, even those resistant to nitric acid. With the cadmium solution a yellow dendrite of cadmium sulphide is formed as a pseudomorph*(6)* of the copper sulphide. Black copper oxide in the core or branches of old dendrites do not dissolve or react readily with these cyanide solutions enabling the analyst to estimate composition and age of such specks in paper. In short, micro-technique and chemical microscopy offer new and improved methods and equipment for solving quickly and accurately such paper testing and mill operating problems bordering previously on the impractical or impossible.

### Factors Affecting Growth of Dendrites

A multiplicity of factors affect the occurrence, nature and extent of growth of metallic dendrites in paper. These include practically all the raw materials of the beater furnish, amount and degree of pulp and stock processing and refining. The sheet structural and surface characteristics such as formation and finish as well as the nature of plant equipment, maintenance, and mill operation must be considered. The microchemical analysis of dendrites in paper always shows

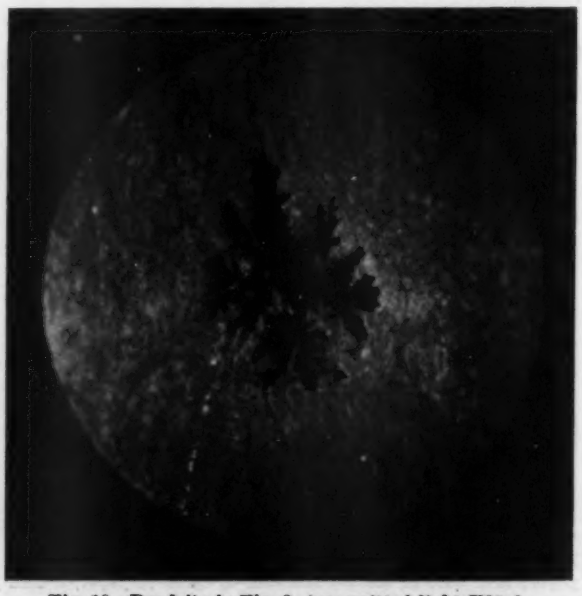

Fig. 10—Dendrite in Fig. 9; transmitted light X30 d.

the presence of copper or bronze particles as the main constituents of the core. Any pulp and paper mill equipment or machinery composed of copper or bronze and used in chemical or mechanical treatment of stock in process may become the prime source of such dendritic growths in the finished paper. In the sulphite pulp mill, any bronze digester fittings, valve seats and disks, pipes, blowpit targets, and wires are subject to attack by hot acid cooking or washing liquors. In some of the older sulphite mills operators have noted frequently a shower of black specks in freshly blown cooks. These specks were tested and shown to be particles of black copper sulphide resulting from corrosion of bronze digester fittings. By use of a powerful spot light and a good telescope or a pair of field glasses such pitting and erosion at the bottom of sulphite digester linings may be observed by periodic inspection directly from the digester floor after a blow. It is well known that ordinary bronze linings and fittings on sulphite digesters will average only six months' service with hot acid liquor compared with six years service for acid resistant bronzes. The importance of corrosion of bronze equipment in sulphite and groundwood pulp mills on product quality has been little emphasized in the past, but since the introduction of alloy steels for sulphite service about 1929, chiefly for purposes of economy, practically all mills are entirely or in part being equipped with such acid resistant steels for handling hot acid and gas. To date about one out of every six mills, has changed 100 per cent from non-ferrous alloys to alloy steels, yet in 1936 over 17 per cent of mills continued to use bronze for cold acid valves and 9 per cent for hot acid valves in spite of economies to be realized and reduction in maintenance costs from 2 cents to 30 cents per ton of pulp by elimination of non-ferrous alloys in sulphite mills. In some pulp mills where chemicals are used in the system, chrome plated or monel metal wires have been substituted in preference to brass or bronze cylinder wires. Such wires will give not only much longer life and reduced operating costs, but improved product quality.

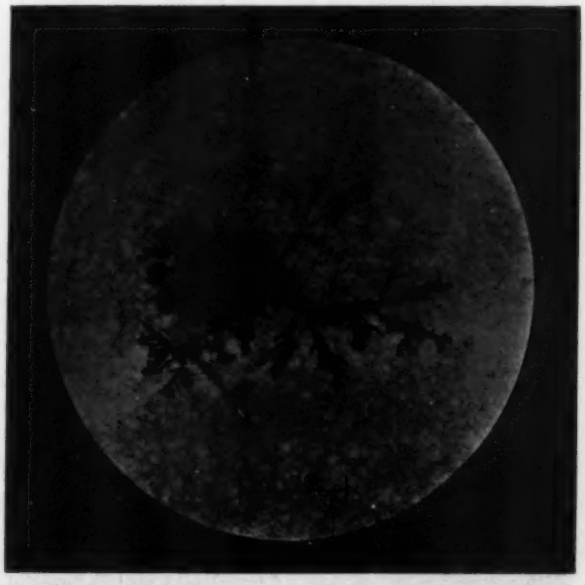

**Fig. 11—Dendrite in 100 per cent sulphite bond paper; transmitted light X18 d. Note the large central core out of which the dendrite projects and size of growth. Actual diameter of core, 1. mm.; length of dendrite, 2.7 mm.**

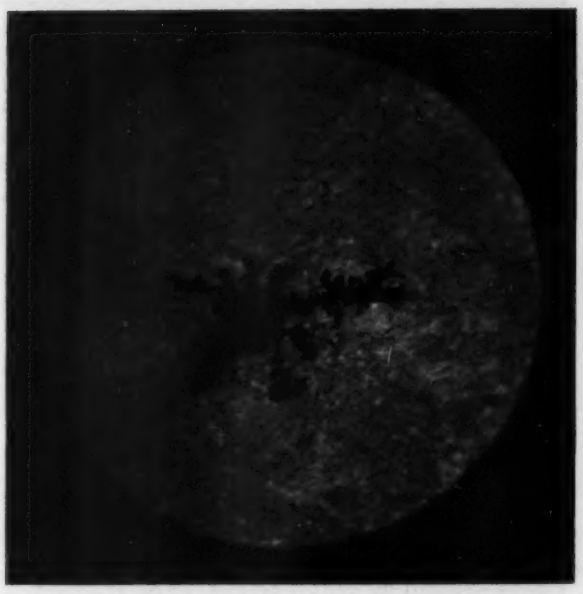

**Fig. 12—Dendrite in chemical wood cellulose writing paper; transmitted light X28 d. Actual diameter of speck in paper, 1.25 mm.**

Bronze particles and dendrites in paper are of interest chiefly in fine paper grades and the manufacture of these represents about 25 per cent of the total fourdrinier production of North America*(7)*. Manufacture of the finest grades is confined largely to the smaller mills and especially those plants which still purchase their sulphite pulp requirements. This practice has made it just so much more difficult for these mills to trace and control the source of foreign material in their finished papers. Undoubtedly the most important sources of bronze in such fine paper mills and the largest contributors to dendrites in papers are the bars in washers, beating and refining engines and to a lesser extent the plunger pump balls, screens and press rolls. Such equipment is common especially in fine paper mills and there are still some 30 rag content paper companies operating in North America alone in spite of the rapid growth and expansion of sulphite and kraft mills. Due to the nature of the stock as well as low machine speeds for fine paper grades the half stock is given a severe and prolonged milling. The tendency is for the soft bronze to wear easily and to yield large as well as minute flakes of metallic particles which find their way into the finished paper (Figure 4). The dendrite cores may result even from corrosion of copper and brass equipment by use of an excess of ammonia in conjunction with chlorine for slime control. The presence of dendrites in fine papers thus affords a control test not only of type of equipment used in a mill, but also skill of operation of equipment, extent of dirt screening, and efficiency of maintenance.

The fibrous furnish composition and degree of stock fibrillation during beating and refining markedly affect the character of the dendrites which may grow in the

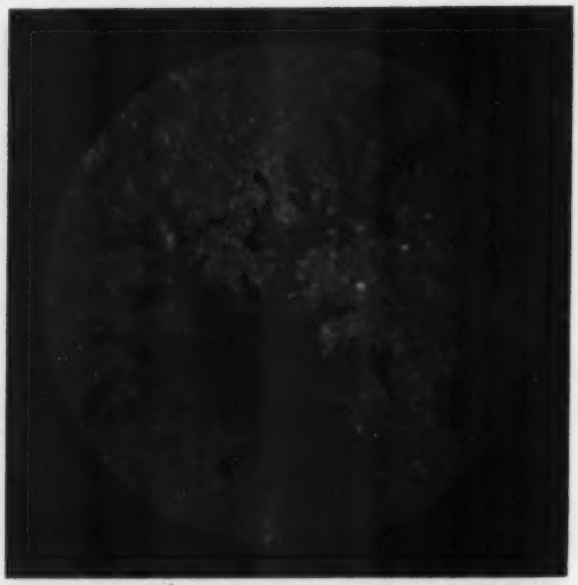

**Fig. 13—Dendrite in 100 per cent coniferous sulphite W.M. Bond paper; transmitted light X31 d. Actual length of dendrite, 2.25 mm. Photo taken within six months after manufacture**

finished paper. It will be noted from the photomicrographs that the dendrites have a tendency to grow on the surface of the paper, superimposed on the fibers in the sheet and with the main axis in the machine direction. The structure of the outer layer of delignified wood fibers has been proven to be crystalline and fibrillar rather than amorphous and homogeneous. The phenomenon of dendritic growth is thus the result of copper sulphide crystals formed in the paper spreading on cellulose crystals in the paper fiber. In a well beaten paper stock the dendrite will be more spreading and diffuse (Figure 5), in a free sulphite stock, the growth along the fiber surface is sharp, well defined (Figures 9 to 13), and also broader than the fine thread-like growth (Figure 14) characteristic of the fiber in an esparto grass sheet. Clay fillers and other mineral loading are a hindrance to growth of dendrites because such components are not fibrous and aid in forming a better closed, denser sheet less porous to air transmission and with a smoother sheet surface. In a highly calendered or super-calendered paper (Figure 3), the sheet density is greater, surface smooth, continuous and free from any surface texture evident in the comparatively rough and contiguous surface in low or regular finish papers (Figures 4, 6, 9). The excessive weight used on the calender stack for high finish papers has a tendency to break down the skin substance of individual fibers and the surface structure of the sheet. And so in highly finished papers dendrites are rare since these offer a poor surface for such overgrowths. Moisture, acidity due to alum or residual chemicals, presence of air or oxygen, temperature, and time are other factors closely related to growth of dendrites in paper. Moisture is indispensable, the theory of the growth of dendrites in paper being supported by the hypothesis that a cycle takes place consisting of galvanic action between metallic bronze nuclei and acid residues in the paper and resulting in dezincification and dissolution of the metallic particles. This is followed by capillary diffusion along the colloidal cellulose fibers, precipitation and absorption as crystalline sulphides, oxidation by oxygen and reduction by hemicelluloses or resins in the paper. Thus, dendrites grow less readily in tub sized or coated papers since these form a protective film on the surface of the fibers. By such treatment the trend is to lower the acidity of the sheet surface as well as exclude oxygen.

Growth of dendrites is accelerated also by a process of creeping of metals. Dendrites may occur in both pure metals such as copper or in solid solutions of metals such as bronze alloy. To a certain extent all metals are plastic and may undergo elongation by a process of creeping due to local slips. By the action of physical and chemical forces in the surface of a sheet of paper as described the bronze particles not only are subject to chemical corrosion resulting in release of strains in the metallic crystals, but such material may exhibit intergranular or intragranular flow. Where the minute metallic units move past each other, metallographers distinguish it as crystal-unit slipping. From the photographs by transmitted light it is apparent that the cellulose fiber surface length represents the natural line of least resistance to the flow and spreading of metallic crystals by creeping or chemical salt solutions by capillarity. Besides, a sheet of paper composed of fibers of porous colloidal cellulose represents a medium with a very large specific or free surface compared to its mass. From a physico-chemical standpoint this is of greatest importance since the chemical reactivity of materials in general is proportional to the free surface of the reagents. Chemical reactivity due to slight acidity and oxygen on the surface of such a sheet may be considered to be many times as great on particles of imbedded metal as would be the case of a flake of bronze in a solution of acid of this concentration even at elevated temperature in a test tube.

The dimensions of dendrites vary greatly and are dependent primarily on the size of the core or nuclei of bronze from which they originate. The size of dendrites shown in Figures 3 to 14 ranges from a fraction of a millimeter up to 2.7 mm., but diameters up to 15.mm. have been reported. In Figure 11, a nucleus of bronze of 1.mm. diameter became a dendrite of 2.7 mm. in less than six months. The nucleus is still very large, but growth has ceased due to coating over of the nucleus by a formation of oxide of copper and low moisture content of the paper. The importance of a principle of critical humidity or paper moisture content and the protective properties of a primary film of copper oxide or sulphide against further corrosion of copper or bronze specks in paper must be emphasized here. When the core becomes oxidized, spreading does not continue to any appreciable extent by copper oxide.

Ordinarily one does not think of paper as a perishable product. Yet, like iron and copper metals, it is subject to a form of corrosion at a rate which can be accelerated by physical, chemical, and microbiological factors. The rusting of metals and deterioration of paper are thus analogous year around hazards to the manufacturer. With a great many classes of household and industrial products fabricated from metals subject to rusting, provision is made for protection of the finished article by the application of temporary or permanent rust

resistant coatings. For improved cleanliness, permanence, durability and printing qualities of both fine and coarse paper grades, paper manufacturers can profit by the investigation of low cost detergents, anti-oxidizing colloids and corrosion inhibitors for use in the beaters, size tub, or at the dryers.

### Analogous Problem in Roto Printing

One of the difficulties encountered in offset printing plants using the rotogravure process is blackening of the copper printing cylinder. In the rotogravure process a copper cylinder is used for printing the illustrations from a positive design prepared without the use of a screen. The plate is etched similar to preparation of halftone plates. In such printing operations where the copper cylinder rotates in a bath of ink and any excess is removed from the surface by a doctor, the depressions in the plate are left filled with ink which is transferred to the paper surface by pressure. Some colored inks are affected by the plates or paper or vice versa. The large free surface of contact of copper metal, paper and ink make the conditions ideal here for greatly increased reactivity of minute chemical residues in the ink or paper. Where a slight excess of acidity or active sulphur compounds are present in the paper or the constituents of the ink or ink thinner, a black deposit of copper sulphide may form rapidly on the surface of the plates and render these unsuited for further printing. At a pH of about 5. the quantity of active sulphur required to tarnish such copper printing cylinders is about .004 per cent. Many of the cheaper colored roto inks frequently contain up to .02 per cent reducible sulphur constituents. Some printing plants make a practice of cleaning any black deposits of copper sulphide from the plates by scrubbing the cylinder with a solution of cyanide or salt and acetic acid. This practice may solve the problem by removing the effect, but a recent and better policy is the improved preventive method of using deactivators or inhibitors in the paper or ink to neutralize the reactivity of any chemical residues present in the system or fix any sulphur compounds in the ink by use of specific agents to prevent tarnishing of copper or similar metals. Fixed alkalies, sodium aluminate*(8)*, borax, barium, bicarbonate*(9)*, lead, zinc and copper*(10)* salts have been recommended for such purposes successfully not only to improve roto and wall paper printings, but even in the manufacture of silver wrapping tissues. Triethanolamine, formaldehyde, aniline, diphenylhydrazine have been used similarly as acid corrosion inhibitors for mill equipment. Whether the copper is present as minute particles imbedded in the paper or as the surface of a cylinder in contact with the paper surface during printing, the nature of the fundamental reactions which produce dendrites on the paper surface or a film of copper sulphide on the printing cylinder surface are the same.

### Some Rigid Technical Specifications

The use of paper for manufacture of condenser tissue and cable wrapping purposes, tabulating card stock for business calculating machines, also purified wood pulp fiber for artificial silk or photographic film and base paper is attributed fundamentally to the chemical stability and high dielectric strength and density of pure

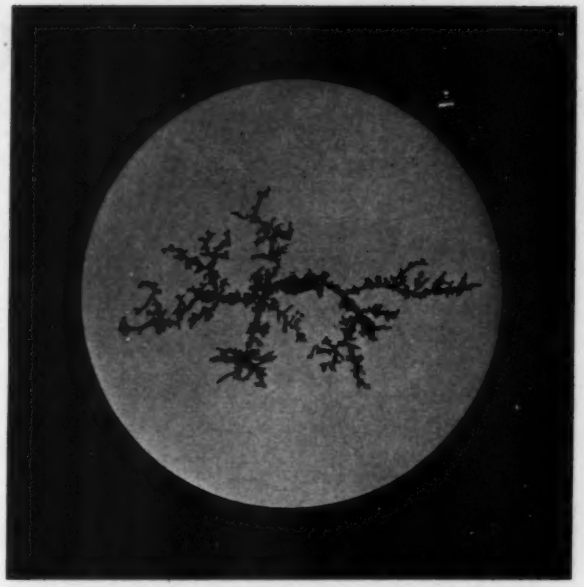

**Fig. 14—Dendrite in 100 per cent esparto paper; R.L. X14 d.**

dry cellulose. Such pulp and paper grades must be very uniform in quality and absolutely free from conducting particles even of microscopic size to be suitable for use in or in conjunction with electrical or photographic equipment. If the paper thickness does not exceed .75 mils, bronze or iron conducting particles in insulation papers may be detected by a more or less laborious method of chemical analysis*(11)* or better with some simple low voltage electrical laboratory apparatus*(12)* consisting of a metal plate, detector and a few dry cells. With thicker pulp sheets and papers like tabulating card stock even imbedded conducting particles can now be detected in the sheet at the machine slitters with remarkable efficiency and on a mill scale basis by a special electrical speck detector*(13)* using staggered brush fingers with an electric pressure potential of 220 volts. In the case of dissolving pulps for viscose manufacture bronze or iron specks in the product would result in clogging of the fine spinneret holes in rayon thread manufacture. The specification of pulp purity for photographic base papers is equally rigid. The useful properties of a photographic film or print paper are dependent not only on the photo-gelatin emulsion, but also on the properties of the support on which it is coated. Many of the defects that occur in the handling of photographic materials are due to minute particles invisible to the eye, and usually but a few microns in diameter. Due to the interaction of copper with silver salts and other organic ingredients in the photo-gelatin emulsion it is obvious that even minute specks of bronze must be eliminated in manufacture of alpha pulps for photographic papers.

### Summary

In this report, the application of the general principles of the science of papyro-pathology in the solution of a paper defect—its cause and cure*(15)* has been presented in some detail. The influence of raw materials, equipment, and process of pulp and paper manu-

**Fig. 15—Dendrite in 100 per cent coniferous sulphite; 25 lb. high wet finish (bulk 62) opaque bread wrap waxing paper, transmitted light X32 d.; actual length of dendrite, 1.25 mm.**

facture on chemical and metallic residues in the finished product have been outlined. The effect of interaction of such residues in the sheet on the quality of paper made has been traced by photomicrographs of dendritic growths and microchemical methods of analysis. The increasing scope of utility and value of optical instruments, such as the camera, microscope, and even the telescope in the laboratory as well as plant operations have been pointed out. The importance of the capillary structure of paper making fibers and large specific surface of porous colloidal cellulose and paper in concentrating and accelerating chemical reactivity at the surface of papers has been described. The action at the interface of two faces of contact in the offset printing process has been cited and value of inhibiting agents in paper making and printing has been shown. Further studies of paper abnormalities directed along similar lines should make possible not only a more intimate knowledge of the structure and properties of raw materials for paper making, but also a better correlation of their functions, with resultant improvements in the equipment and process of manufacture of pulp and paper of better quality with economy of plant operation.

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## Spraying Coal with Oil*

AS GENERALLY accepted the oil treatment of solid fuels to dustproof them controls 70 to 90 per cent of the objectionable fine dust. Such improved cleanliness was the original objective of experiments to produce dustless coal. However, as a result of spraying mineral oil on coal, additional benefits have been discovered—viz:

1. Freezing of moist coal in railroad cars, bins, and bunkers prevented at low temperatures
2. Coal cars, bins, and equipment protected against corrosion
3. Lubrication of the feed of mechanical stokers improved
4. Combustible weight, or B.t.u. value of coal, increased
5. Moisture absorption reduced
6. Spontaneous combustion tendencies minimized with some grades of coal
7. Segregation of fires in stoker coals lowered.

Experience indicates that for freezing temperatures, oils with a low pour test and a viscosity ranging from 100 to 200 (Saybolt Universal Test) at 100° F. are the most suitable for de-dusting purposes.

Sprayed oil coatings will last from six months to a year, depending upon the quantity and volatility of the oil used and the type of fuel treated. Slack and small size coals require about 1 gal. of oil per ton; whereas larger sizes require only about 2 qt. per ton.

The equipment for applying oil to solid fuels includes a storage tank, oil pump, pipe lines, and spray nozzles. With low pressure pumps operating at 100 to 150 lb. per sq. in., heating elements are needed to raise the temperature, and thus lower the viscosity, of the oil so that it can be broken into a fine mist by the spray nozzles. With high pressure pumps delivering at 300 to 600 lb. per sq. in. (ch) the oil can be forced through the spray nozzle in an atomized form without heating. In this case it is merely necessary to maintain the temperature high enough for the oil to flow through the pipe lines from the tank car to the storage tank to the pump.

The choice of nozzles depends upon the pump pressure, the oil characteristics, and the desired rate of discharge. Using cone shaped or flat sprays, the oil should be applied to the fuel as it tumbles through space—for example, at the end of a loading boom. This permits all sides of the coal to come in contact with the spray.

(*) From the December, 1937, issue of *Industrial Power.*

# Alum . . . Its Use and Effect

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**Abstract**

*The object of this presentation is to call attention to the customary lack of consideration by papermakers of the function of the alumina portion of the alum which they use. Failure to appreciate the utility of the alumina content is discussed. References to water purification literature disclose efficient utilization of alum. The futility of attempting to appraise the use of alum by acidity measurements is pointed out. More economical use will result from a properly balanced viewpoint of the function of alum in papermaking.*

PAPERMAKER'S alum is aluminum sulphate containing less water and more $Al_2O_3$ than the crystal, $Al_2(SO_4)_3 \cdot 18H_2O$. A typical analysis is as follows:

| | *Percentage* |
|---|---|
| Combined $Al_2O_3$ | 16.90 |
| $H_2SO_4$ (equivalent) | 48.80 |
| Uncombined $Al_2O_3$ | 0.35 |
| $Fe_2O_3$ | 0.40 |
| $H_2O$ | 41.30 |
| Insoluble | 0.10 |

The water of hydration in the commercial material approximates 14.2 $H_2O$ for each $Al_2(SO_4)_3$. This does not conform to the formula of known hydrates which are 27, 18, 16, 12, 10, 9, 6, 3 and 2 $H_2O$, respectively.

As an essential papermaking chemical, the composition and influences of each of the components of alum should be better understood and appreciated. The acidity of the alum serves to break down size emulsion, to harden the stock if required and to provide the acidity necessary for use with a number of dyes employed in the paper industry. The alumina content is a valuable aid in retention of rosin in sizing, filler and dyes, as well as for controlling water drainage on the paper machine. One reason for the presence of so much water of combination is to assure stability after manufacture, in order that the active ingredients may remain readily available for use.

### Alum Tonnage

Of the 315,000 tons of alum distributed in 1935, *Chemical & Metallurgical Engineering(1)* estimates that 117,500 tons were used in the pulp and paper industry in the United States. Since the paper mills consume so much alum, should there not be more widespread appreciation of its alumina component?

In recent years we have heard a great deal about the undesirable influences of alum on papermaking machinery and on the finished products. Consequently, efforts have been made in many mills to reduce alum consumption. Actually the complaint has arisen because of the excess acidity which has prevailed. It is the author's belief that, when the diverse functions of the components of alum become better understood, the paper industry will be using more alum rather than less. Recently the use of alum had been advantageously extended to grades in which it was not heretofore thought to be applicable.

### What About the Alumina?

The mention of alum as an item of beater furnish is quite prevalent in papermaking literature. Frequently, proper analysis of these data cannot be made because the two individual factors, namely, alumina and acidity, which are likely to exert controlling influences, are not differentiated and described.

For example, an investigator who employs alum will tell of his success in clay retention, rosin sizing, or what not, stating that the work was done under conditions which yielded various pH values and let it go at that. With only this meager information about the solution in which the work was done, we are still in a quandary. The ultimate fate of the alumina, as well as the acid radical of the alum, needs to be determined in order to evaluate the investigations.

Surely it is reasonable, when reading technical reports in this field, to expect a balanced chemical accounting. In appealing for information about alumina we are merely inquiring as to the whereabouts, the condition and the influence of a well known inorganic substance. In case the circumstances are such as to place obstacles in the way of rendering a balanced account, and explanatory statement should be made. The influence of the alumina should not be ignored.

The fact that there is no reliable simple test for alumina, which can be made as easily as a pH determination, may be the reason for this lack of information. This, of course, is merely a poor excuse which will seem even poorer when the paper industry realizes more fully the importance of alumina. Improved testing technique is needed.

### Clay Retention Examples

Albert*(2)* records work of the Finnish investigator, Roschier, who "made up his furnish and then neutralized part of the alum with dilute caustic soda before adding the clay. Even with the alum constant, pH has a decided effect on retention," as shown below in terms of percentage.

| pH | 4.3 | 4.45 | 4.47 | 5.15 | 5.6 | 6.35 | 6.7 | 7.1 |
|---|---|---|---|---|---|---|---|---|
| Retention | 36 | 38 | 45 | 50 | 52 | 53 | 55 | 51 |

Albert's expression ".... pH has a decided effect on retention.." has a familar ring which is reminiscent of the common confusion of effect for cause. Many papermakers talk about pH as if it where an item of the furnish and having a causal influence. Besides, they do not seem to realize that a whole tank car of sulphuric acid has the same pH as a single drop of its contents. Under no circumstance is pH a cause; it is merely a measure of a single attribute of the effect produced by the acid component of alum, plus the acidity or alkalinity of other substances present in the solution.

The maximum clay retention reported by Roschier

was at pH 6.7. In this instance, with uniform use of alum, we have a series of pH and retention values. Surely in the absence of other test data we are not justified in assuming that the intensity of acidity, as measured by pH values, is the sole and fundamental characteristic to be considered. The alumina precipitate, which was undoubtedly formed, was not credited with its share of the work.

It is to be noted that Roschier added the alum and caustic soda before adding the clay. Presumably this was done at beater consistency, in which case he was using what was little better than a preformed alumina precipitate to enhance retention in the sheet. As a result of water treatment experience, both in water works practice and with dilute stock suspensions in paper machine operation, we would expect that greater benefit would have been derived from the coagulating precipitate if it were made after the addition of the clay and preferably at a time of maximum dilution of the stock. A coagulating precipitate is invariably most beneficial if formed when maximum dilution prevails. Proper timing and mechanical influences are desirable.

Schwalbe*(3)* records other works of Roschier, wherein alum was used as a coagulent for increasing the retention of mineral filler. The author states that the best results were obtained at pH 5.5. In this instance ten normal sodium hydroxide solution was used in amounts which were substantially equivalent to the alum used in the series.

| Percentage | | Percentage Filler Retention | |
|---|---|---|---|
| Alum | pH | 10% Filler Added | 20% Filler Added |
| 0 | ... | 32 | 33 |
| 1 | 5.65 | 29 | 30 |
| 2 | 5.60 | 45 | 40 |
| 3 | 5.50 | 50 | .. |
| 4 | 5.60 | 53 | 55 |
| 5 | 5.60 | 58 | .. |
| 6 | 5.50 | 63 | 67 |
| 7 | 5.70 | 71 | 71 |

The table shows that there was a gratifying increase in clay retention with increasing amounts of alumina precipitate which presumably was formed. This time while increasing filler retention Roschier did not merely increase the percentage of alum in the series. He took pains to see that the alumina became effective and that the intensity of acidity did not increase. It will be noted that in this instance Roschier found a different optimum pH point from that used in his other work cited by Albert*(2)*.

This table also shows that when only one*(1)* per cent of alum was used there was less of filler retained than when no alum was used. This phenomenon is not unusual when alum is used as a coagulent.

### Alum in Water Purification

The classic work of Theriault and Clark*(4)* is especially illuminating in this connection. They investigated the efficiency of alum coagulation from the standpoint of minimum time of precipitation. They found that the optimum pH value for alumina precipitation is approximately 5.5. Their work was done with aluminum sulphate and solutions of sodium hydroxide and calcium hydroxide under laboratory conditions. Since these conditions do not prevail in the paper mill, it is desirable to ascertain the optimum pH value of each papermaking operation wherein alum is used. Theriault and Clark state: "The hydrogen-ion concentration of the final mixture of water and alum is of fundamental importance in the formation of floc."

After the optimum precipitation point for the alumina floc is known the next step is to ascertain how much of the floc is needed to accomplish the desired effect. Uniformly good results in practice are not possible unless both favorable pH range and suitable quantity of floc are assured.

### Coagulation of Great Lakes Water

Hatfield*(5)* in Michigan made a study of the behavior of alum in water purification using Lake St. Claire water and determined that "The apparent iso-electric point is at pH 6.1 to 6.3." He further states: "The differences between Dr. Clark's*(4)* and these results are probably due to the impurities of a natural water with its dissolved neutral and buffer salts, turbidity and organic matter." Continuing, Hatfield states: "From the standpoint of residual alum in the effluent of the Highland Park Plant, it is quite clear that the minimum allowable dose is about 0.6 grain per gallon of alum. More alum than this minimum is sometimes necessary to remove the high turbidities."

This is a typical example of what is well known to filter plant operators; namely, the fact that it is futile to use less of alum than the job requires. They also know that the effect of the use of alum is frequently not in proportion to the amount used. The effort expended in determining the proper quantity to be used is invariably justified by improved results and economies.

Quoting from Hatfield*(5)*, "Hatfield*(6)* has shown that reasonably good coagulation of a water of variable alkalinity always begins at a pH value of 7.6 to 7.8, providing the original pH of the water was higher than 7.8; also that this coagulation point was independent of the turbidity. He found that the most efficient point to operate the Highland Park Filtration Plant was at a pH value of 7.2." In his accounting for $Al_2O_3$ Hatfield used the procedure of "Standard Methods of Water Analysis"*(7)*.

### Highly Colored Soft Water

Norcom*(8)* when working at Wilmington, N. C., with water from the highly colored North East Branch of the Cape Fear River, encountered a set of circumstances which were entirely different from those met by Hatfield. Norcom dealt with a water which had a high content of organic coloring matter. He reported that optimum results in decolorizing the public water supply at Wilmington occurred at a pH very near 4.4. He remarks: "It should be stated that there is always a minimum value of alum below which complete decolorization cannot be obtained. This is to be expected since there must be at least sufficient alum present to completely react with the color if complete precipitation is to be attained."

Norcom's experience in coagulating color-producing organic matter in water is analogous to the necessity of using an adequate amount of alum to set rosin size.

### Acid Not a Substitute for Alum

In a private communication, Norcom stated that at Wilmington he made extensive studies to determine if it were possible to substitute acids for a portion of the alum. He found it necessary to use alum to supply the alumina required to combine with the organic substances of the water. Mere acidity was not helpful. His conclusion that alumina is needed to combine with the organic matter, closely parallels papermaking experience in rosin sizing where the futility of depending on the acidity of white water, as a substitute for alum, is recognized.

### Alum in Papermaking

Frequently, when papermakers need more alumina in the system they add more alum without considering how the alumina is to be precipitated and thus to become of service. Whenever alum is added the sulphates are increased at nearly three times the rate at which the alumina is increased. That is, for each 17 parts of alumina added, the sulphuric acid equivalent is being increased by 49 parts.

Each of the components of alum, namely the alumina and the acidity, exercise independent functions. Under some circumstances the ratio of alumina to acidity which prevails in the solution permits them to co-operate for maximum benefit. On the other hand, the ratio of the components present may not be economically useful. Often the net effect of the addition of more alum runs counter to the papermaker's purpose, for the reason that an excessive quantity of acidity hampers sheet formation. Almost invariably, where difficulties arise from the use of too much alum, they are due to the presence of excess acidity. Too much of alumina, rarely, if ever, occurs in the water suspension of the stock.

There are two reasons why acidity builds up in the papermaking system. One is because of the selective action of the cellulose in absorbing the alumina portion of the alum. Besides, the excess alum which has been furnished and not decomposed contributes its increment of acidity. For closed system operation definite steps to limit acidity should be taken.

### Dependence on pH Data

It seems to be the custom, after adding alum to a papermaking system, to consider no analytical data except the pH values at which the pertinent phenomena occur. In paper mill practice it should be remembered that pH measurements are not quantitative for weights or volumes of acidity or alkalinity. Far too much faith is apparently placed in the pH test when evaluating the key characteristics of the solutions with which papermakers are dealing. Frequently pH test data are misleading. As interpreted, in many cases, such information tends to set up a false sense of security. On the other hand, when considered along with adequate supporting information, pH data are invariably helpful. One item of supporting information, which may be easily determined by titration, is total acidity or for alkaline solutions, the alkalinity. At the 1932 Fall Meeting of TAPPI, attention was called*(9)* to the desirability of making quantitative acidity tests when appraising water quality in papermaking.

### More Information Needed

Titration and pH tests, in the absence of supporting data, do not tell what has become of the alumina portion of the alum. We should know it if it has been precipitated and also about the amount, if any, which remains in solution.

When it comes to appraising the behavior of a water suspension of stock it must be realized that a wide variety of factors govern. The performance of the forming wire, which invariably acts in accordance with the laws of nature, is influenced not only by the few factors, which are customarily taken into account, but also by a host of others the importance of which most of us are still unmindful. Instead of relying on the usual fragmentary chemical test data pertaining to wet end operation, we should give more attention to the little appreciated influences of the various items of the furnish and the conditions of operation. If this were done some of the apparent complexities of papermaking would disappear.

An increased demand for fundamental data will naturally result in the development of suitable indicating and recording instruments in order to evaluate and control wet end performance. The familiar array of indicators and recorders, to be found in the modern steam and electric generating plant, encourages the hope for similar development for the wet end of the paper machine of the future. At present, although the volume of materials handled is many times as great as at any other point in the paper mill, the wet end is still "no man's land" for the instrument maker.

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◆ GOOD RELATIONS BETWEEN EMPLOYER AND EMPLOYEE are fundamentally human relations. They are generally found to thrive when there is a common objective, good faith on both sides, human understanding, and a recognition of each other's legitimate interests. Good employee relations are not created overnight but develop gradually. At the same time they are elusive, and serious mistakes of management may in a short time destroy the good will that has required years to build. Thus the day-to-day human contacts between those in positions of leadership and employees are the foundations on which good industrial relations may be built.

(Quotation from *Functions of the Personnel Director,* published by the Metropolitan Life Insurance Company.)

# The Brazilian Paper Industry

REO BENNETT

In these days of intense nationalistic sentiments, Brazil's paper industry might be called a "Synthetic National Industry." Some 80,000 tons of cellulose were imported from Northern Europe, Canada and the United States during the twelve months terminating December 31, 1936. The mechanical equipment of the industry has been imported, though national manufacturers are beginning to offer beaters, digesters and smaller accessories, and the technical staff is invariably of foreigners. It is not that Brazil cannot produce the raw material; on the contrary, it is within the scope of her destiny to become a great exporter of cellulose in the near future, but, until now, the simple arrangement of heavy duty upon manufactured paper and free entry to the raw material makes an irresistible appeal to the practical men who direct the destinies of the country's paper industry.

A rather formidable paper manufacturers' protective association, and clumsy propaganda of overproduction, has maintained the present situation. The Ministry of Finance, however, sees in the vast expenditure for cellulose an exchange complication that might be remedied and offers enticing opportunities to foreign or national capital to fill the demand with national raw material. Even the more progressive manufacturers are experimenting with national sources of fiber and planting great reserves of those best suited to climatic and soil conditions against the prophesied European war and its possible effect upon the price and supply of cellulose.

Twenty-eight mills with an annual capacity of more than one hundred thousand tons of every type of paper except newsprint supply the market. These mills, representing a capital of more than twenty million dollars, give employment to twenty-odd thousand persons. The dates of installation of the various fourdriniers in actual service extend from 1888 to 1936. One authority goes so far as to say that all but the first three machines are still working.

The mills in operation at the present time are listed in the accompanying table below.

These mills manufacture every type of paper including book, printing, calendered, coated, cover, writing, tissue, cigarette, cardboard, wrapping, and wallboard. However, National educators publish statistics which indicate that Brazil is very low in the production of textbooks; and printers corroboratively insist that they are forced to refuse orders for lack of paper, delay in delivery or excessive prices. The importation of all types of paper including roofing paper and cellophane has fallen to less than 5,000 tons annually and the importation of cellulose, some of which is used in the textile industry, has steadily risen to something like 80,000 tons. The internal contribution is estimated at 72,000 tons annually, including national pine, rice straw, bagasse of sugar

| Name | Location | Annual Capacity Metric Tons | Products |
|---|---|---|---|
| Companhia Melhoramentos de Sao Paulo | Cayeiras, Sao Paulo | 13,000 | Book, type-writing tissue, crepe, etc. |
| Gordinho Braune S. A | Jundiahy, Sao Paulo | 3,500 | Writing, fine papers |
| Ribeiro Parada & Cia. Ldt | Limeira, Sao Paulo | 3,300 | Wrapping paper |
| Brasital S. A | Salto de Itu, Sao Paulo | 2,500 | Writing, wrapping |
| Comp. Fabricadora de Papel | Sao Paulo | 16,000 | Cigarette, writing, wrapping, printing, etc. |
| Comp. Santista de Papel | Sao Paulo | 13,000 | Manilla wrapping |
| Comp. Agricola Industrial de Coruputba | Estacao Moreira Cezar, Sao Paulo | 5,600 | Cardboard, bristol, wrapping |
| Elias Teffeha | Sao Paulo | 1,500 | Wrapping |
| Comp. Industrias Brasileiras de Papel | Cachoeirinha, Parana | 3,500 | Cardboard, wrapping |
| Fabrica Paranaense de Papel | Morretes, Parana | 1,200 | Wrapping, cardboard |
| Comp. Fabrica de Papel Itajahy | tajahy, Santa Catharina | 1,500 | Writing, wrapping |
| Justo & Companhia | Sao Leopoldo, Rio Grande do Sul | 300 | Wrapping |
| Comp. Fabrica de Papel e Papelao | Porto Alegre, Rio Grande do Sul | 420 | Wrapping, cardboard |
| Fabrica de Papel Santa Maria | Porto Novo do Cunha, Minas Geraes | 2,800 | Wrapping paper |
| Fabrica de Papel, Santa Cruz | Juiz de Fora, Minas Geraes | 2,200 | Wrapping paper |
| Fabrica de Papel Chuzeiro | Bello Horizonte, Minas Geraes | 250 | Cardboard |
| Comp. Industrias Brasileiras Portella | Jaboatao Pernambuco | 8,000 | Serpentines, wrapping |
| Comp. Industrial Pirahy | Sant' Anna, Rio de Janeiro | 3,500 | Fine papers, book, printing, etc. |
| Comp. Fabrica de Papel de Petropolis | Petropolis, Rio de Janeiro | 3,800 | Calendered, coated, printing and book |
| Comp. Industrias e Cartonagem | Mendes, Rio de Janeiro | 8,000 | Cardboard, printing, tissue |
| Comp. Nacional de Papel | Engenho Novo, Rio de Janeiro | 2,800 | Printing, wrapping |
| A. de Silva Araujo | Tijuca, Districto Federal | 1,500 | Wrapping |
| Comp. Industrias e Cartonagem | Tijuca, Districto Federal | 1,500 | Tissue paper |
| A. R. Coutinho | Tijuca, Districto Federal | 1,200 | Cardboard, wrapping |
| Fabrica Sao Geraldo Ldta | Rio de Janeiro | 720 | Wrapping |
| Simao & Cia | Sao Paulo | 1,500 | Wrapping paper |
| Fabrica de Papel de Pedra Branca | Rio Grande do Sul | 500 | Wrapping paper |
| Costa Ribeiro | Apprecida, Sao Paulo | 4,500 | Wrapping paper |
| Raul Rudge | Inhauma Rio de Janeiro | 4,000 | Cardboard, wrapping |

cane, bamboo, Jaragua grass, lilies, rags and used paper. The statistician remarks that the apparent discrepancy of material used, as compared with paper produced, is attributed to losses in fabrication. All newsprint, some 45,000 tons, is imported by the newspapers, free of duty, but it is all watermarked against re-selling and great penalties are imposed for any divergence of paper from the actual printing of the papers favored. There is also a treaty with Portugal whereby Portuguese printed books may be imported with little or no duty.

**History of Industry**

It was in 1851 that a notable engineer, Dr. Guilherme Schuch de Capanema—later Baron de Capanema, resolved to erect a paper mill at Oriana in the Serra de Estrella, at the head of the bay of Rio de Janeiro. This site probably was chosen because of water power. The machine had an effective width of 1.75 meters. The only material used was rags and they rapidly rose in price until they became prohibitive. In 1858, the Baron experimented with and actually used a certain amount of pulp made from various plants of the Bromelia family but suspended operations in 1859.

The record shows, however, that this mill was not the first to manufacture paper in Brazil. According to Mello Moraes, in his *Botanica Brasileira,* published in 1881 "a mill was established in Conceicao, Bahia in 1843, which used the stalks of banana plants for raw material. The daily journals and the commerce patronized this growing Brazilian industry with general satisfaction until it was killed by the extraordinary drop in the price of foreign paper against which it could not compete and it had to shut its doors to the great prejudice of its patriotic promoters."

In 1870, there were five wrapping paper mills in Rio de Janeiro. In 1880, Felicio de Santos built the Guttenburg mill at Mendes on the Central Railway of Brazil. The mill now belongs to the Companhia Industria Papeis Cartonagem (paper and cardboard).

The first installation in Sao Paulo, the present center of the National Paper Industry, was made by Adolpho Melchart and his sons, at the Falls of Itú, in the Tieté River. A son, Antonio, a mechanical engineer by profession, went to Holyoke, Mass., studied papermaking and brought back a machine and supplementary equipment necessary to make paper from national material. Two years after the inauguration of this mill it was using local raw material exclusively. After passing through various hands, the mill, with its original machine, duplicate of which was exhibited at the Paris Exposition of 1888, is still operated by Brasital (a contraction of Brazil and Italy).

From 1890 to 1917, there seems to have been no noteworthy development in the industry. In the latter year, however, Bird & Company, of Neponset, Mass., at the suggestion of Cameron Forbes, who was Receiver for the Brazil Railways, purchased a small mill at Morretes in the State of Paraná, and used a lily,

**A Parana pine forest in Santa Catharina, one of the Southern States of Brazil. This wood will run 60,000 to 75,000 board feet to the acre in the virgin forest. Only one mill, that of the Companhia Industrias Brasileiras de Papel in Parana is utilizing Parana pine at present to make wrapping paper, cardboard and wallboard. (Photograph by Arthur Wischral)**

**Auracaria Brasiliana (Lambert). Popularly known as Parana pine. This tree represents one of the oldest forms of vegetation known on earth and may be considered as descending from the age of coal. John Muir, poet of the Sierras, came all the way from California to see the Araucaria forest. This tree is 100 feet high; it is 60 feet across the crown and four feet in diameter. It is not anything like the giants of the family but just a fair specimen of an Araucaria upwards of 100 years old. (Photograph by Reo Bennett)**

Lyrio de Brejo *(Hedychium Coronarium)*, an imported ornamental plant which had become a veritable pest, for the making of wrapping paper. The old mill was modernized with new buildings, a new steam plant and new equipment; but with the termination of the receivership, Bird & Company abandoned it. In the hands of German experts, it is now producing upwards of 1,200 tons of cardboard and wrapping paper a year.

In 1921, The Brazil Railways, an American company with French capital and administration, established a mill at Cachoeirinha, Paraná, to make cardboard and wrapping paper from Araucaria Brasiliana, popularly known as Parana Pine, or Umbrella Pine. This mill has been eminently successful and its original capacity of five tons per day has been increased to 3,500 tons a year. The mill was established for experimental purposes, but the financial condition of the parent company never admitted the construction of a large plant to take advantage of the data collected during fifteen years of successful operation.

The stories of Gordinho Braune & Company, of the Melhoramentos of Sao Paulo, of Klabin and Company which started at the little old mill at Itú and are the largest producers of paper in South America—are not history but rather history in the making.

**Brazilian Raw Material**

Brazilian authorities estimate that about fifty per cent of the total 5,319,490 square miles which constitute this vast country, is covered with forest. Much of the forest has never been drawn upon because of transport problems and, peculiarly enough, there is even a timber shortage in big consuming centers. Eighty per cent of this forest consists of what might be classified as tropical or sub tropical growth and twenty per cent of comparatively pure stand of *Araucaria Brasiliana* (Lambert). The tropical growth consists of *Madeira de Lei,* legal wood, which is the Brazilian designation for hardwoods, reserved for the construction of warships for the Portuguese navy in Colonial times. These woods are used for furniture, interior trim, parquet floors and the like today. Together with the hardwoods are the Madeira Branca or softwoods, which have been little used until now in Brazilian industry.

The first obstacle to lumbering operations in the virgin Brazilian forest is the great variety of vegetation encountered. In a given ten acres there may be no two trees alike, or there may be a grove of a given

**A Parana pine 20 years old. This tree is 60 feet high, six feet in circumference and the branches are 45 feet across. The lack of rosin in the wood and the length of fiber (4.50 millimeters) make Araucaria one of the finest sources of cellulose for paper and textiles. (Photograph by Reo Bennett)**

type here and another there, softwoods and hardwoods of every description, a joy to the botanist, the despair of the lumberman. In the more accessible regions, the commercial hardwoods have been more or less removed and the softwoods left to thrive; forests magnificent to the unpracticed eye and disgusting to the experienced lumberman.

In Brazil there is forest where there is rain, and where there is rain and mountains there is hydraulic power. Given rain and the prevailing temperature, there is rapid growth such as those familiar with temperate growths would accept with incredulity—conservatively, the rate of growth is at least twice as fast. Under sub-tropical and tropical conditions, rings are no indication of age. The author recently counted 27 rings on the log of a pine tree known to be 10 years old.

It is the great Parana Pine forest, which offers the most interesting proposition at the present time. This species is the only tree in Brazil which grows in pure stands. This vast forest is about one thousand miles long and fifty to two hundred miles wide. Skilled American timber cruisers have estimated that there must be upwards of 350,000,000,000 board feet of this pine, more than all of the other commercial timber in all Brazil. The virgin forest will average seven to ten thousand board feet to the acre. The mature trees are twenty-five to sixty-five inches in diameter and from sixty to one hundred and twenty feet in height. The sapwood is pale yellow and submits readily to bleaching. The green logs have a specific gravity of about 1.420 and those of seasoned timber .550. The wood contains no rosin, it being all in the bark which is readily removed. The remarkable length of the fiber (4.50 millimeters) classifies it as among the longest cellulose fibers known.

**Softwood trees of the Brazilian forest along the coast range from Southern Bahia to Santa Catharina, trees that have never been tried out for cellulose. (From an old lithograph)**

The Companhia Melhoramentos de Sao Paulo (Weisflog & Company), one of the most progressive of Brazilian paper manufacturers, not only maintains a complete experimental laboratory but has planted a vast forest of selected trees. Over a ten-year period it has studied various growths for length of fiber, width of fiber, color, rapidity of growth, and the like—In all, 121 different sources of cellulose. A possible indication of this company's findings may be found in the fact that it has planted 7,000,000 Araucaria pine trees and is planting at the rate of 1,000,000 a year.

**Forest of Parana pine, growth as seen from the Sao Paulo & Rio Grande Railway, the north and south road which connects Sao Paulo with Uruguay. This is young growth on burned over land. (Photograph by Arthur Wischral)**

# Motion Pictures in the Paper Industry

**Lyne S. Metcalfe and H. G. Christensen***

WIDESPREAD increase in the use of motion pictures in business generally, and the development of certain phases of motion picture technique, including sound, presents new possibilities for use of this medium in the paper industry.

The industry in the past has put this medium freely to use for various purposes, educational, advertising, sales promotion and selling. Some of these productions have been made and sponsored by paper manufacturers and organizations while others have been of the strictly informational-educational type—released by educational groups and educational picture exchanges mainly for class-room use.

Recently, an increasing number of paper concerns have been considering the wider use of pictures in selling and sales promotion.

Among the foremost users of the medium to date have been The Hammermill Paper Company whose "Voice of Business" has been shown widely throughout the country, and which, besides having definite sales promotion value, is informative and interesting.

The Union Bag and Paper Company's production, "It's in the Bag" attracted much attention as an interesting and valuable contribution to America's library of paper movies. The Kalamazoo Vegetable Parchment Company has contributed "Paper Making" which has been circulated widely over the non-theatrical circuits and which has been welcomed everywhere by educators for use in school rooms and college auditoriums.

The *Chicago Tribune* contributed an interesting papermaking reel, "From Trees To Tribunes" which covers interestingly and graphically the manufacture of newsprint from lumbering to the printing press. Another production which has had wide circulation in schools is titled "From Tree To Newspapers" and the making of fine writing papers has been pictured by various of the eastern mills in the past with satisfactory results.

Besides, there are numerous motion pictures visualizing the lumbering end of the papermaking industry.

Broadly speaking, the uses to which motion pictures lend themselves in the paper industry are these:

(a) Informational-educational, showing papermaking processes in all their stages
(b) Sales promotion pictures, for showings before paper buyers and users
(c) Advertising pictures, for showings before business men as at lunch club gatherings, and the trades allied to papermaking
(d) Sales training, and personnel instruction
(e) Technical phases of papermaking, for study, analysis and archives

However, as is the case generally where manufacturers use talking pictures, they provide a first rate sales and demonstration medium for the paper manufacturer in graphically presenting paper quality factors, adaptation to the needs of the printer in particular jobs, and to the needs of the user of paper for varied purposes.

For long, considerable mystery has surrounded the paper machine, and the processes involved in turning raw materials into the beautiful smooth papers that serve the world today. Movies have taken and are taking much of the mystery out of the business, and the subject is an exceptionally interesting one from

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**Left—Unloading pulpwood from boats. Right—Wet end of paper machine. Illustrations from the motion picture "The Voice of Business"; courtesy Hammermill Paper Co.**

the picture standpoint because everyone uses paper every day in many forms, and people generally are interested in the origin of the familiar things with which they come into intimate, every-day contact.

Development of motion picture technique offers certain treatments to the paper industry in its efforts to dramatize and visualize the sometimes intricate but always interesting phase of its activities.

We now have:

1—Animated technical drawings which delineate, in motion, and in cutaway cross-section, intricate machinery and processes
2—Micro-cinematography, by which textures and other detail may be magnified, with brilliant illumination, as much as 40,000 times
3—Natural colors
4—Slow motion and speeds by which action may be speeded up many times or slowed down many times
5—Natural sounds as they are heard in the mill or sounds of machinery and equipment in motion

Particularly, has the advent of color (two or three colors) opened new picture possibilities to the paper manufacturer who has long looked for methods by which the colors of his product may be shown with exactitude to the prospective purchaser or user. It is now possible to almost perfectly match the colors and shades of fine writing papers, for instance where, a few years ago, the results were often more or less of a gamble on the screen.

An additional but secondary use is found in motion pictures for and of mill employees. Many of the larger mills show movies as a part of their personnel recreational work, selecting pictures that have an informative value as well as value along the line of entertainment.

Then, too, motion pictures may be shown in connection with exhibits at paper conventions, and printers and paper distributors' meetings, and in this respect the possibilities are great.

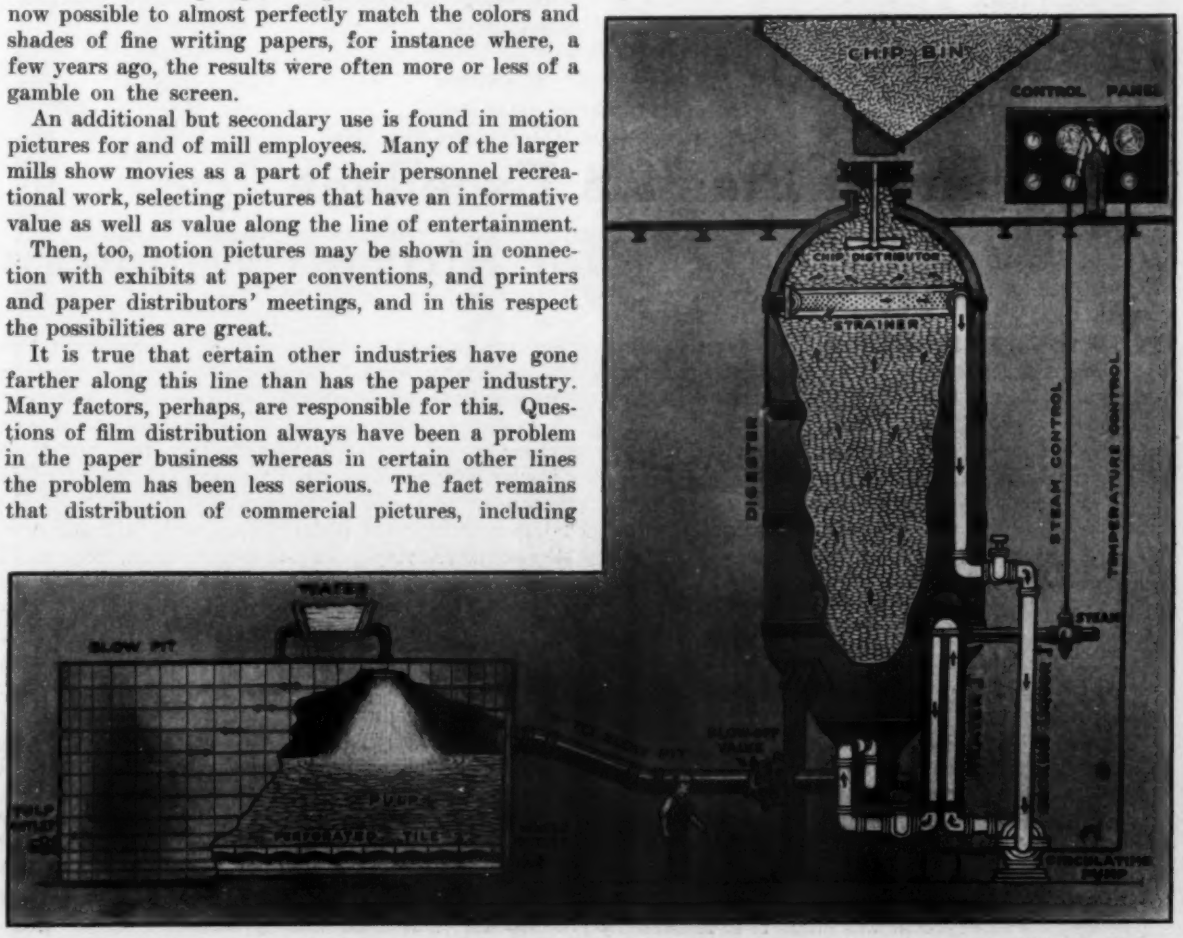
It is true that certain other industries have gone farther along this line than has the paper industry. Many factors, perhaps, are responsible for this. Questions of film distribution always have been a problem in the paper business whereas in certain other lines the problem has been less serious. The fact remains that distribution of commercial pictures, including paper pictures, to the general public has become a simple and inexpensive operation. In addition to a hundred or more so-called non-theatrical exchanges and distributing agencies, there is the Motion Picture Bureau of the YMCA which distributed over 400 reels last year and whose non-theatrical audiences have totalled several million over a twelve months period.

Over 40 colleges and universities now have film distributing departments supplying pictures to schools and lesser educational institutions in their regions. Then, there are the churches and service clubs always looking for commercial pictures that are interesting, informative and worthwhile.

It also is now possible to have papermaking pictures circulated in over 5,000 theaters at a cost that is surprisingly small per impression made or per audience member. Hundreds of industrial concerns with stories to picture of far less general interest than the story of papermaking in all its many phases, are using these circuits for the pictures which they have produced.

In order to be productive for the investment made, a motion picture designed to do a job for a paper mill must be carefully planned in advance to attain the objectives desired.

It must be remembered that the general public today —and this includes all paper buyers and important




**Papermaking processes may be shown in animated cross-section drawings—in motion. Courtesy Hammermill Paper Co.**

Shooting a commercial talking picture in a model studio. Courtesy West Coast Sound Studios, Inc.

paper users—are familiar with a high technical quality in the productions commonly seen in theaters. It is now possible to approximate this quality minus lavishness or costly showmanship in the modern commercial studio. It always is possible by cutting corners to produce a picture cheaply but the quality of commercials has improved vastly in recent years, and experienced users have learned that to do an effectual job, a fair investment is necessary or the job had better be left undone.

Reference is chiefly made to a good script, good lighting, interesting story treatment, qualified direction and expert editing.

The modern business picture needs a note of sincerity, an interesting theme, and above all, a professional touch.

# Transparent Plastics Excellent for Aircraft Windows

THE results so far obtained in a project established at the National Bureau of Standards by the National Advisory Committee for Aeronautics, for study of the suitability of synthetic resins and cellulose plastics for aircraft windows, are reported in the Bureau Research Paper 1031.

Cellulose acetate plastic was found to have excellent impact strength, bursting strength, and flexibility, but the commercial products tested varied considerably in resistance to weathering, and all were subject to marked shrinkage in one year's time. The shrinkage produces warping and sets up strains in the plastic sheets, which cause them to craze and crack. These strains are believed to be the cause of the spontaneous cracking of cellulose acetate windshields after they have been in service for six months or longer. This is particularly true of windshields exposed to the low temperatures encountered at high altitudes. A great deal of variation was observed in the weathering resistance between cellulose acetate sheets received from different manufacturers and also between different lots of the material from the same manufacturer.

The acrylate resin plastic was found to be remarkably transparent, more stable to light and weathering, and more resistant to scratching than cellulose acetate, but it is deficient in impact strength and flexibility. Surface crazing of the acrylate resins was noted after one year of exposure outdoors, and also after storage for a similar period. It is claimed, however, that a method of processing has been developed which eliminates this tendency.

Other transparent plastics, such as cellulose nitrate, ethylcellulose, vinyl chloride-acetate resin, and vinyl acetal resins, failed in resistance to weathering after approximately three months. Glyceryl-phthalate, styrene, and phenol-formaldehyde resin plastics discolored markedly on exposure to sunlight or ultraviolet light from a carbon-arc lamp, and also lacked flexibility. A sample of cellulose acetobutyrate was practically unchanged after 12 months of exposure. With the exception of the cellulose nitrate, cellulose acetate, and acrylate resin plastics, the materials tested were of an experimental nature and were not recommended for use on aircraft. Many of the undesirable properties observed for these experimental materials will undoubtedly be eliminated in the course of development, and it is not improbable that some of them will later become available in a form suitable for windshield use.

# Paper Sketches ---

THE INVENTOR, M. SZELELMY, IN 1869, DESIGNED AND CONSTRUCTED AIR-TIGHT AND WATERPROOF COFFINS OF PAPER. HIS COFFINS RESEMBLED IN BUILD AND THICKNESS THE MUMMY CASES OF ANCIENT EGYPT.
IN MAKING UP A ROLL OF PAPYRUS, THE BEST SHEETS WERE USED TO FORM THE FIRST OR OUTSIDE PAGES, THE SHEETS BEING PASTED ON ACCORDING TO QUALITY, SO THAT THE POOREST PAGES WERE ON THE INSIDE OF THE ROLL, WHERE THE "WEAR AND TEAR" WAS NOT SO GREAT.
CONSUMPTION OF CABLE PAPER BY THE BELL SYSTEM DURING 1937 APPROXIMATED 2,881,000 POUNDS.
AS EARLY AS 1862, PAPER WAS SUBSTITUTED FOR COTTON IN THE MAKING OF TWINE—DUE TO HIGH COTTON PRICES BROUGHT ON BY THE CIVIL WAR.

# Atmospheric Moisture and Its Relation to Newsprint

**WM. BAUMRUCKER, JR.**
**New York Daily News**

ATMOSPHERIC moisture and its relationship to printing is a subject about which there is a great deal of talk without much scientific investigating ever having been done. Pressmen have always held that on damp, rainy nights they get better runs with less breaks than on dry nights. The air conditioning companies are very positive in their claims as to what their equipment will do for our printing. However, unbiased evidence never seems to have been collected and an accurate analysis made of the true effects of humidity on the running condition of a web press. Therefore, early this spring it was determined to collect data which it was thought would tell the whole story.

There has been plenty of work done and plenty of articles written on the effect of humidity on register for multicolor printing and that phase of the question was not restudied. The investigations have covered solely the effects on newspaper black presses where register is not a problem.

When the commission to write this article on the effects of moisture on the running and printing quality of newsprint paper was accepted it seemed certain that the data on hand and the data being gathered would enable an authoritative conclusion to be drawn so that the whole truth concerning these two most important items could be told. Now the investigations as planned are completed and the data analyzed and it must be confessed before starting this treatise that the story remains incomplete.

Many things have been found out and certain conclusions seem indicated, perhaps even proved, but the most valuable thing that these investigations have brought forth is an accurate and comprehensive picture of the problem itself, of just what is needed to be known about this subject and just how we should go about arriving at the true answer of its effect on printing; what data should be collected, what variables should be guarded against, etc. Paralleling this is needed further laboratory study of some phases of the subject. After all, a complete statement of a problem and a plan of action are necessary before much can be accomplished on such a matter as this.

If the statement of that problem in this article arouses further action and further investigation in other pressrooms which will enable us to eventually know all the answers, the preliminary reconnoitering will certainly have been worth while. With that as the present status of the problem it seems advisable to reduce this story to conversational rather than technical lines. First it will be best to tell just what was done and what was found out.

For those who are not familiar with the terminology of humidity and air conditioning it should be understood that the moisture capacity of air goes up rapidly as the temperature is raised. *Relative* humidity is the ratio of the actual amount of moisture in a body of air at any given temperature to what that air could hold at that temperature if saturated. *Absolute* humidity is the measurement of the water vapor per pound of air. It is noted as grains per pound of dry air, or vapor pressure in inches of mercury. At a constant temperature the absolute humidity will vary as the relative humidity is changed but if the temperature of air with a given weight of water in it is varied the relative humidity varies while the absolute humidity stays constant. Fifty per cent R.H. at 65 deg. is quite a bit less moisture than 50 per cent R.H. at 85 deg.

The conclusions indicated below are those which seemed indicated and which seemed to be of constructive value. Those conclusions which it was thought might be reached but were not will be mentioned later.

### Summary of Conclusions:

(1) There seems to be no particular relationship between printing quality and the humidity of the air surrounding a web on a high speed newspaper press.

(2) There is no relationship between the running quality (tendency to have breaks) of a newspaper press web and the *relative* humidity of the surrounding air. There seems indicated however, a decided relationship between running quality and absolute humidity. It appears that the moisture content should be kept as high as 95 grains per pound of air for best results on this score. This corresponds approximately to 70 per cent relative humidity at 75 deg. Fahr., 60 per cent at 80 deg. Fahr., or 50 per cent at 85 deg. Fahr.

The data which was assembled for this survey and the reasoning followed in arriving at the above conclusions is as follows:

(1) The number of breaks per hundred rolls run in the two New York Daily News pressrooms were tabulated by months for the past three years.

(2) The number of breaks in paper for which defects such as slime holes, calender cuts, etc., could be found and blamed directly as the cause of the breaks were tabulated by months from January to October 1937. The tabulations were kept as total breaks minus defect breaks, per hundred rolls. There is a possibility of question as to the completeness of data on the number of defects. The best that could be done was to take those defects the pressroom found and sent up. There may well have been more breaks due to defects but there is no record of them for it is not easy to find a defect in the mass of waste paper after a break.

(3) A humidity record was kept from January through October 1937. This was calculated both as relative and absolute humidity. From June through October it was kept as a daily record.

(4) During a four-month period the quality of printing each day was judged and assigned an arbitrary numerical rating.

(5) From June to October 1937, the data on total breaks per hundred rolls was kept as a daily record on each individual run.

This whole moisture problem was, in this instance, studied independently of the paper storage problem. Pressroom humidity only was considered and the rolls were assumed as being brought in and run with no appreciable storage time in the pressroom atmosphere.

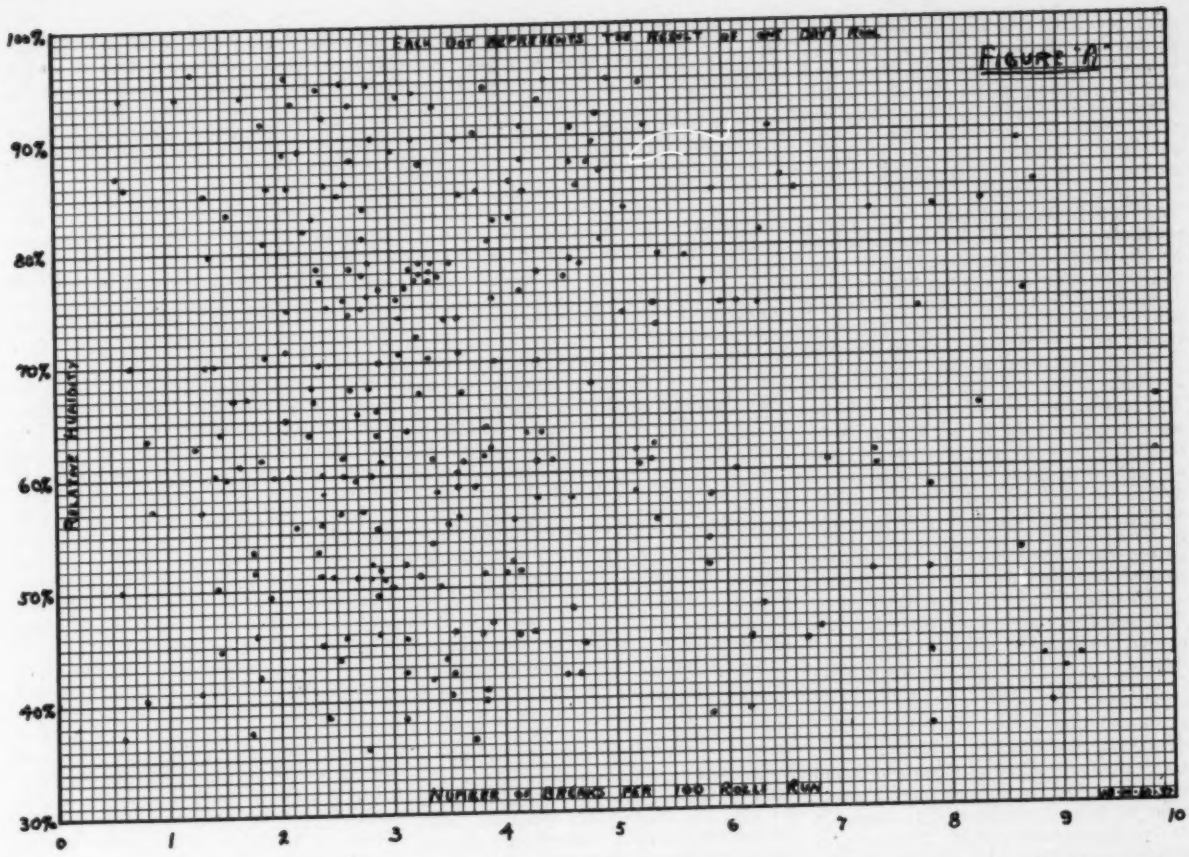
(For the data on humidity, one reading was taken early in the night and the assumption made that this was a representative measure of the condition of the air that night. This, of course, is not strictly true inasmuch as the presses ran perhaps six hours after the reading was taken. A better way, which method is now being followed in *The Daily News* pressroom, would be to install a recording humidistat and thermometer from which a chart record can be taken and examined and a truly representative figure for the moisture in the air obtained.)

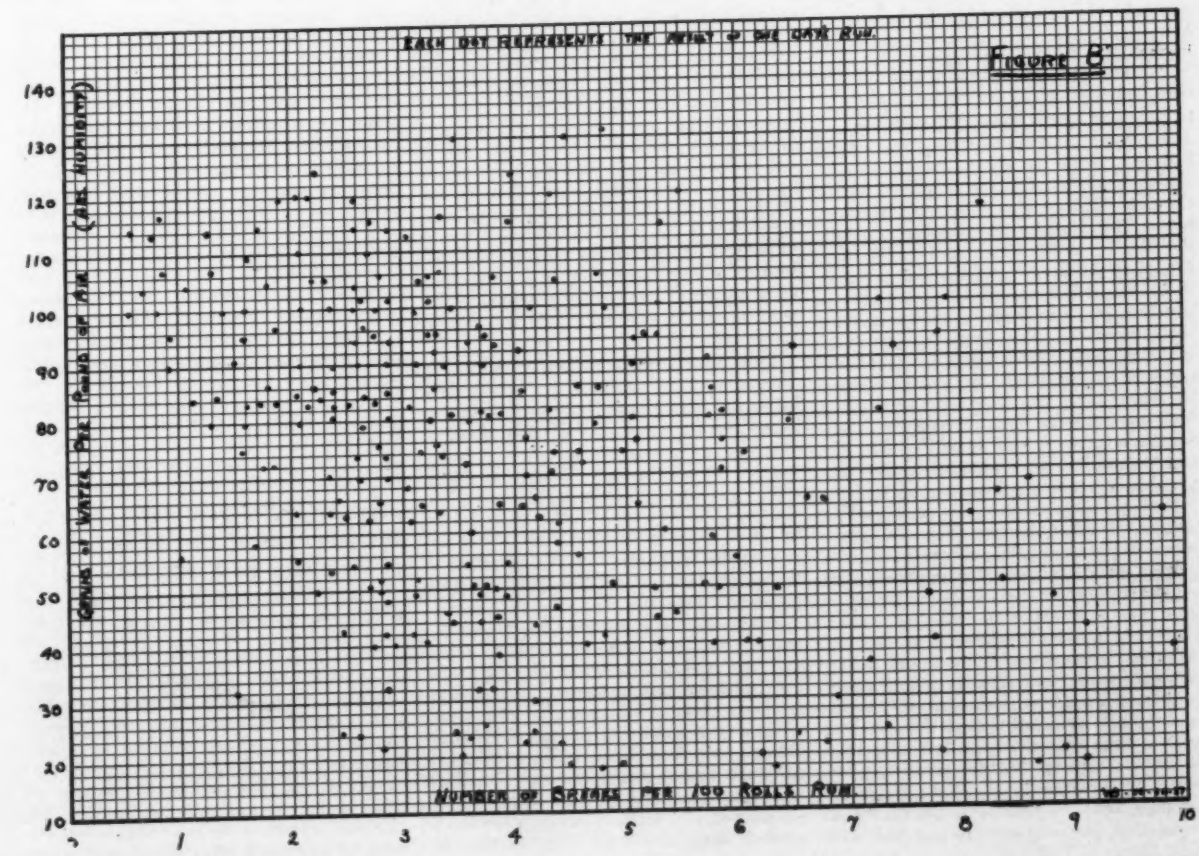
Some of the paper which was run was fresh paper. Some was old and this old paper was stored under all conditions; short periods, long periods, dry warehouses and damp warehouses. This introduces variables into our tests and the best that can be done is to hope there were enough runs to blanket out effects other than those watched for.

From the above data, curves were plotted some of which are reproduced herewith. An attempt was made to plot printing quality vs humidity, but no correlation at all could be found. If there is any relationship existing there are entirely too many other variables entering into the matter for the effect of humidity to show up at all. Good and bad plates, ink settings, impression, paper and engravings, all seem to have effects which greatly over balance any condition which may be due to humidity. There may be a relationship but it could not be found. The humidity considered here was relative humidity. Results were so bad that it was not considered worth while to bother with absolute humidity calculations.

An attempt was made to plot breaks per hundred rolls vs relative humidity for the individual runs from June to October, with the result shown on Figure A. There is no correlation whatsoever.

However, when the humidity figures


EACH DOT REPRESENTS THE RESULT OF ONE DAY'S RUN.
FIGURE "A"
RELATIVE HUMIDITY
100%
90%
80%
70%
60%
50%
40%
30%
0
1
2
3
4
5
6
7
8
9
10
NUMBER OF BREAKS PER 100 ROLLS RUN.


EACH DOT REPRESENTS THE RESULT OF ONE DAY'S RUN.
FIGURE "B"
GRAINS OF WATER PER POUND OF AIR (DRY HUMIDITY)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
NUMBER OF BREAKS PER 100 ROLLS RUN.

were calculated over to absolute humidity as shown in Figure B, there seems to be a possibility of a cause and effect conclusion. High moisture content in the pressroom air apparently does not guarantee a good run but at any rate it does permit of a good run, whereas when the moisture falls below 80 grains per pound of air, we find fewer and fewer low break runs. Each plotted point represents one day's average running result and humidity. The lower left hand edge of the plotted points slants from less than 1 per cent breaks at 90 grains to 2.5 per cent breaks at 40 grains. If a line is imagined drawn through the densest areas of the plotted points it also has a definite southeast slant.

From the data which was kept by months rather than by days, the curves in Figure C were drawn. These curves are not of as much value as Figures A and B for when the monthly results are averaged there is liable to be a much greater effect from storage time and the conditions under which the paper was stored and other variables. We have only a lump figure, and no idea of whether that figure was arrived at from an average of good runs on dry days during the month and poor runs on the damp days or not. However, the curve for total breaks per hundred rolls, while it has one unexplainable drop in January does definitely drop down in the summer months when the air is moist. The curve for breaks minus defects per hundred rolls, while not so abrupt, also drops off during the summer period. The curve of absolute humidity (11 months of this year) is also given as an indication of how the total moisture content of the air increases in the summer time.

Theoretically, there are many reasons why moisture in the air might be thought to preclude better running conditions. A damp paper is more flexible, less brittle and less liable to break. Small defects such as shives on the edges will go through that might otherwise start a tear. The Bureau of Standards paper, RP 633, by C. G. Weber and L. W. Snyder, shows that a very marked increase in tensile and tear strength of paper is effected by increases in moisture content. However, this same bulletin also contains graphs showing the rate of absorption of moisture by paper exposed to damp air. The rate is surprisingly fast, but not nearly fast enough for much moisture to be picked up in the one second or so that a newspaper web is exposed before being printed.

Perhaps there is another angle to this matter of rate of absorption. A great many paper absorption curves have been plotted by researchers for various kinds of paper but not one of them seems to give the thickness of the sheet as a function of the rate of percent absorption. All that is noted is the type of paper. It would seem that data on a thin sheet could never apply to a similar sheet twice as thick. Is it possible that newsprint is such a thin film of paper that it is able to take on a considerable percentage of water in a second or so? This should be investigated. If true it is perhaps possible that the air surrounding the web could have an effect. The curves referred to covered blotting paper, book board, litho and manila papers of unstated thickness and in some cases, unstated weight.

It seems to be an accepted fact that there is much less static when the paper is run in damp air than in dry. It may be that this reduction in static alone was enough to cause the better running conditions shown in the plots of Daily News pressroom experience for running in air with high moisture content, but it will take more investigating to prove this out.

While speaking of theory it would be well to mention a point of discrepancy among authorities as to whether the pertinent changes in physical characteristics of paper are due to relative humidity or to absolute humidity. Most researchers claim the critical condition to be that of relative humidity, though R. H. Brown of the Parks-Cramer Company, Fitchburg, Mass., in an article in the May 1937 issue of the Printing Industry asserts that absolute humidity is what should be considered. The Daily News investigation was started with an open mind on this matter but the findings based on all the data gathered to date seem to agree with the absolute humidity claimants. That is to say that you not only need humidity, but warmth as well and the more warmth, the less humidity.

The matter of the condition of the rolls when brought in has, of course, a lot to do with the whole static question. Rolls brought in icy cold, fresh from a freight car in the winter, or rolls that have been stored eight or ten months in a heated dry warehouse, are sure to cause static no matter how damp the pressroom air may be. A roll that has come to moisture equilibrium with cold air, even if it be damp cold air, will be a dry roll when it is warmed up and even though the roll is not warmed up, the web acts dry when run in a warm pressroom. This is the relative vs absolute humidity angle coming in again. It looks as though it would be helpful if researchers would plot some rate of temperature gain data as well as moisture gain data, to fully explain what goes on in the case of a cold roll run in warm air.

From these considerations it might be concluded that perhaps it is absolute humidity that should be controlled in a paper storage room, rather than relative humidity. Possibly the old idea of keeping the windows open, letting in damp outside air in winter is not enough. We may need to add both heat and moisture to the storage room air to get the moisture content high enough. This is another matter on which more investigations must needs be done.

An attempt was made to correlate laboratory tests on the moisture in the paper and the storage condition of the rolls, etc., without much success. It also was tried to note variations in the total weight of the rolls after long periods of storage which should indicate whether moisture was picked up or lost and there was not enough difference noted to be considered. Further investigation is needed along this line. Possibly the roll does not actually change in moisture content, but is merely warmed up or cooled off relative to its original condition, which changes its relative moisture condition. There quite evidently is *some* change and what that change is should be determined.

There are occasions when atmospheric moisture can work harm on a roll's running quality. One of these is in the case of incomplete conditioning of a dried out roll. If the moisture is not given a chance to get in further than a few inches on one or both ends, the result is a web tight in the center with baggy ends. This might make it liable to break and it might cause wrinkles which cannot be removed by any tension setting. Conversely a fresh, damp roll, stored in a dry place and partly dried out may be found to be tight on the edges and baggy in the center. Such a roll is quite likely to break. No data is on hand as to just how long it takes to produce the above phenomena under any definite atmospheric condition, but it is another question that must be answered before all can be considered as known about moisture and newspaper presses.

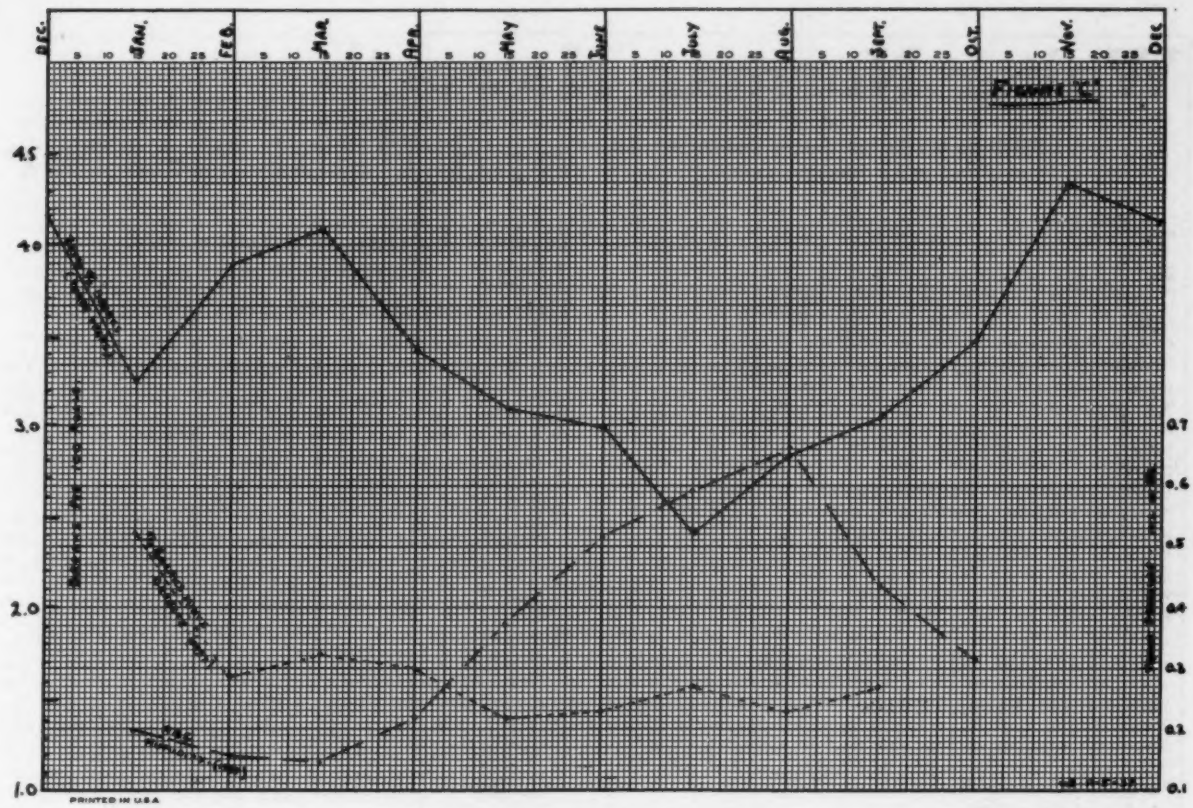
The above discussion covers the story of paper and moisture as thoroughly and as specifically as can be done with the data available. As stated, there seemed to have been some conclusions indicated but it would be stretching the imagination too far to consider those conclusions as having been definitely proven. There is needed a very comprehensive study of the whole subject. Together with theorizing we need accurate data from, not one, but many pressrooms.

Outlined below is a list of data which, if gathered in sufficient quantities and carefully analyzed, would give us the whole story on this matter of the effects of humidity. Such a program will be put through in the plants of the New York News in the near future and it is sincerely hoped that other newspapers will also investigate this subject in like manner. It is a proposition that needs to be thoroughly aired.

There is a possibility that the newsprint paper companies might advantageously foster investigations in various pressrooms among their customers. Surely the reduction in the number of complaints due to paper trouble which might possibly be effected by proper humidity conditions would work out to the newsprint company's advantage.

## Suggested Program for Investigation of the Effect of Humidity on Newsprint

A pressroom planning to investigate the effects of humidity on storage and running conditions should be prepared to go into the matter on a large enough scale to insure representative evidence, leaving nothing to the chance of an occasional good run under any sort of air condition. Care must be taken to insure impartial data, being sure that every observed run has an equal chance of being good. It may not be possible for any one pressroom to run enough control rolls to guarantee that their results are




correct, but if enough pressrooms try it and all, or most of them, have the same experience, we can be sure we are on the right track.

It would be advisable to install a recording humidistat, or at least take daily humidity readings (also temperature, for absolutely humidity calculation) in the pressroom, and keep a record of daily experience on the number of breaks per 100 rolls and also the number of breaks minus defects per 100 rolls. This data can be used to check the experiences described above in this article, giving an overall picture with no reference to the storage conditions.

To check the effects of both storage and pressroom atmospheres a more involved procedure is necessary:

A large shipment of newsprint from one mill and all manufactured at one time should be split three ways when received. One-third of the rolls should be run off as soon as possible. One-third should be stored in the usual unhumidified warehouse. The other third should be stored in a room where it will be possible to add moisture up to a desired known humidity, and keep it fairly constant. This is a simple matter, and should not be confused with expensive air conditioning, where equipment is needed to remove moisture from the air. When each of these three batches of paper are run, accurate records should be kept of the number of breaks experienced and of the pressroom humidities on the days they were run.

An attempt should be made as described above to accurately determine how many of the breaks experienced are due to defects in the rolls or perhaps to mechanical press trouble so as to obviate the chance of ascribing breaks to humidity when they would have occurred no matter how the moisture was.

The stored rolls should not be run off all at one time, but in small batches at intervals of a month or so, so that the last ones run will have been stored 8 or 10 months. Data on each run should be kept separately. Paper should be run very soon after being brought to the pressroom from the warehouse.

Analysis of these runs should be made as follows:

1. An overall comparison can be made between fresh paper, dry stored paper and damp stored paper.

2. Effect of pressroom air on paper of constant moisture condition storage can be determined, care being taken not to include effects of storage time.

3. Effect of storage time on running quality can be determined, for dry stored paper and also for damp stored. Care should be taken here not to include effects of pressroom humidity variations.

These analyses can probably be most easily made and studied if they are made by plotting the results on graph paper, taking two variables at a time.

A program to accurately determine the effect of humidity on the printing quality of newsprint paper is a more complicated proposition. The only real way to do this would be to keep a press set up with plates on and ink adjusted. This should be set up in a room where the humidity can be varied. If possible, papers should all be printed from one or similar rolls of paper, a few being run at each humidity. Care should be taken to insure data independent from storage humidity conditions. A judgment of these printed papers would give us some information on the question of printing quality vs humidity. It would be very difficult to carry out the program in this way but unless we can be sure that there are no other variables entering into the quality of the printing we cannot say that we have the answer.

Theoretically, there does not seem to be much chance of picking up enough moisture from a fast running web to make much difference, but there is a possibility which, as far as is known, never has been investigated and that is that the outer layers of paper fibers a few ten thousandths of an inch thick on the surface of the sheet, might conceivably be quite effected by atmospheric moisture in a second or so even though the total percent moisture gain is not great. Since this outer layer is where the ink is applied, there exists the possibility of some correlation between printability and the moisture in the air in the pressroom.

It may be seen that this treatise is but an introduction to the subject of the effects of humidity on newspaper presses and paper. Such presses have paper troubles. If humidity or its lack are to blame for any of these troubles such a fact should be made known. It is to be hoped that much more work will be done on this greatly discussed, but little known subject.

# Walter Norman Haworth and Paul Karrer

## Nobel Prize Winners for 1937—Contributors to the chemistry of cellulose

**LOUIS E. WISE, Professor Emeritus**
**New York State College of Forestry**

IF, in looking over the leading newspaper items on Friday, November 12, 1937, you got safely past the truculence of the Japanese Foreign Office, the Chinese retreat from Shanghai, the bill for the state ownership of coal in Great Britain, the latest Soviet purge, and the proposed changes in our tax laws, you may have noted that, on Armistice Day, the Swedish Academy announced the prize awards in physics, chemistry and literature. One of the physicists, Dr. Clinton Davisson, of New York, may have been known to you. There may have been a reminiscent sound to the name of Thomson, the other physicist to be honored. He is the son of a former, famous Nobel-prizeman, Sir J. J. Thomson. The French writer was probably an unknown quantity. Unless you were a chemist, it is probable too that you had never heard about Walter Norman Haworth of Birmingham or Paul Karrer of Zurich. Walter Haworth, the slender Lancashireman in his early fifties and Paul Karrer, the Swiss organic chemist in his late forties were the joint recipients of this greatest of all material awards.

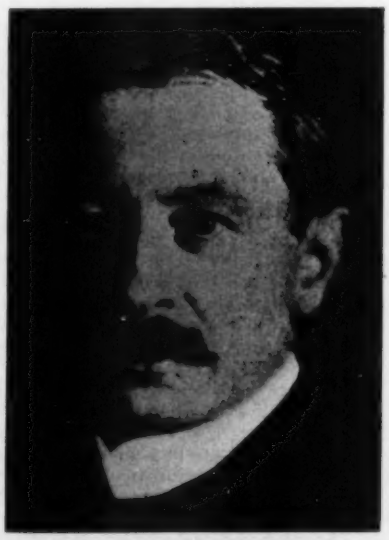
What had these men done that was so extraordinary? Why should this major scientific honor go specifically to them? What criteria were there for the importance of their work? And what of the men themselves?

In the scientific world to-day, it is doubtful whether one man can rely solely on his own effort to effect a great achievement. More and more do we rely on mass effort. However among scientists there are certain catalysts—certain men who because of their own genius stimulate others to seek new adventures in research. Such an individual, as a result of his own driving energy, unusual skill, and high integrity, may carry with him scores of enthusiastic co-workers and challenge limitless numbers of colleagues in other laboratories to renew their own efforts. Such research workers are "key" men. And Haworth and Karrer belong to that small, noteworthy group.

A few words about Dr. Haworth, whose work I have known for 15 years past. In the summer of 1926, I met him by appointment at Oxford. In the morning it had been my privilege to hear him speak before the British Association for the Advancement of Science. It was an epoch-making talk, for it presented some of the data that later unfolded themselves into hundreds of researches and which finally brought to his work the recognition that he deserved. That afternoon, with two other colleagues, he took me for a bus ride to Abingdon. It was a joy to be his guest. That morning I had marvelled at his quiet, clean-cut explanation of the work at Birmingham. In the afternoon, while browsing through an old abbey, at Abingdon, I was amazed at his knowledge of medieval architecture and church history. We had tea in the old town near the bank of the river. Then we returned "up" to Oxford, again atop a bus. It was on the return trip that I asked his advice, and that we discussed some of the work in which he was so rapidly becoming a master.

Years before, Professor Purdie of The University of St. Andrews in Scotland had discovered a method for forming the methyl ethers of sugars, i.e. methylation. Haworth turning to this method had extended and improved it, and had used it repeatedly (together with other original techniques) in gaining a clearer insight into the chemical structure of the carbohydrates. As a result of this old, as well as the newer lines of attack, coupled with an uncanny insight in his interpretation of data, Haworth had postulated a new chemical structure for the commonest of all simple sugars—glucose. This modification of the structure was slight but extremely significant. Instead of the accepted formula (No. 1), Haworth had shown the actual configuration to be:—as in Formula No. 2. His findings started a series of polemics, especially with the great physical chemist, C. S. Hudson, and with Dr. James Irvine, one of Haworth's colleagues at St. Andrews. Haworth, building always on carefully tested experimental data, and guided by rare vision, stuck to his guns. His thesis has withstood all attacks. His experiments were confirmed by other investigators and now the second formula given above is generally accepted as the true one for glucose. As glucose is a hydrolysis product of other sugars (like ordinary cane sugar), the formulations of these were also affected. And as starch, and glycogen and cellulose also yield glucose on acid treatment, these important polysaccharides came in for a revision of their chemical architecture. As time went on, a new impetus was given to the reinvestigation of *all* the simple sugars, of disaccharides, and also of the complex polysaccharides like starch and cellulose. In other words, the entire field of carbohydrate chemistry was reopened, and the assurance with which we write the recurring anhydrocellobiose unit (No. 3)—the characteristic unit of cellulose, is in no small measure due to the genius of Haworth. It is not altogether surprising therefore, that the wireless to the *New York Times* in announcing the prize awards stated: "The complete renaissance that carbohydrate chemistry has undergone in the last decade is credited to a great extent to Dr. Haworth's work." The man Haworth would be the last to minimize the work of men beyond the confines of his laboratory, or the brilliance of his students and

**Prof. W. N. Haworth**
*(The Times Weekly Edition, Nov. 18, 1937)*



**Prof. Paul Karrer**
*(Science News Letter, Nov. 20, 1937)*

co-workers. But in its essentials the newspaper report is correct.

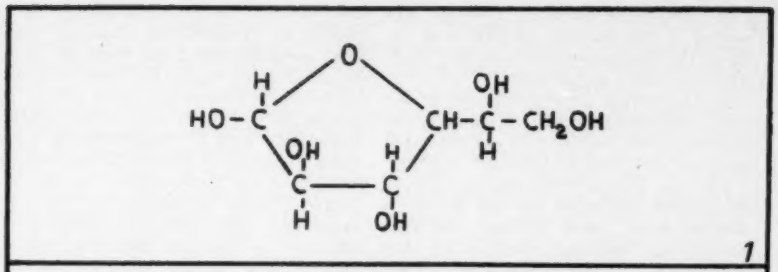
In 1933, Hirst and Haworth and their associates, using crystallographic measurements and X-ray analyses, established the structure of vitamin C—which is found in citrus fruits and cabbages, and which protects the human organism against scurvy. That same year, they actually synthesized vitamin C, which proved to be a relatively simple substance formed from a derivative of the sugar xylose. The vitamin was found to be identical with levo-ascorbic acid, and may be formulated as in Formula No. 4. This is a relatively simple substance, very subject to reversible oxidation, and to another delicate form of chemical change, involved in the so-called enolic-ketonic tautomerism which is shown in the equilbrium formulated above. Undoubtedly this great achivement also helped to gain the Nobel prize for Haworth, and in this, as in other fundamental researches, his brilliant co-worker Hirst cannot be forgotten.

I have said that vitamin C may be obtained indirectly from the sugar xylose. This sugar may be isolated from the hydrolysis products of hemicelluloses obtained from straw, bran, and also from wood—especially the hardwoods. So even this vitamine has a distinct though very distant relationship to a component of one of the raw materials of the pulp industry. And needless to say, Haworth's work on the sugars and on cellulose are of lasting value.

Within the past few years Haworth, by applying the methylation technique to cellulose, hydrolyzing the methyl-ether, and then carefully analyzing the products, has attempted to gain an insight into the length of the cellulose molecule. When cellulose is completely methylated, and then hydrolyzed, it yields *almost* quantitatively, 2, 3, 6-trimethylglucose. Almost, but not quite. A very small fragment is 2, 3, 4, 6-tetramethylglucose. By finding the ratio between the percentage of the tetra-compound and that of the tri-compound, Haworth was able to form a rough estimate of the mean molecular weight of cellulose. According to their computations it is 20,000 to 40,000. This is lower than are most of the other estimates of its molecular weight, in which different methods were used. But as Dr. Stamm of the U. S. Forest Products Laboratory has pointed out, the various investigators "do not all measure the same thing" In any event, Haworth has used a bold, delicate, and purely chemical attack on the difficult problem of molecular magnitudes of the polysacchrides. For he has applied this technique to other compounds besides cellulose. In 1934, the same year that Haworth received the Davy medal for his remarkable researches, he outlined the development of the organic chemist's study of cellulose. He also summarized his previous work (and that of other investigators) in the form of a brief monograph and in various reviews, and his articles have enriched the literature of the carbohydrates from year to year.

Let us return to that bus ride, up from Abingdon. You will recall that I had asked my host, Dr. Haworth, for his advice. I was on Sabbatical leave from Syracuse, and it was my intention to work with another man who had gained an international reputation as a research worker. But Dr. Haworth dissuaded me. He demonstrated then, his utter impatience with slipshod work, with poor critique, and most of all with sham. The man that I had in mind was an excellent lecturer, a fine organizer, a masterful politician, but not a great research worker. (This estimate was later substantiated. It became clear that the man that I had in mind had gained his reputation largely as the result of the work of others.) Where should I work? Dr. Haworth had a number of suggestions. He had received his training at the University of Manchester and at Göttingen. He had taught at the Imperial College of London; then at St. Andrews, and at Durham. The year before we met he had been called to Birmingham as Professor of Chemistry and Director of the Department. "Of course, you would be most welcome at Birmingham—our laboratories are well equipped, we have good facilities for research."

For several days thereafter I thought the matter over. The urge was very strong to work with this man, whose genius was so apparent, whose creative faculties and incisive critique had made such a lasting impression. Largely because of the health of my family—which included my two young children, and the possible difficulty of weathering a winter in England, I declined a wholehearted offer. Regrets are vain, of course.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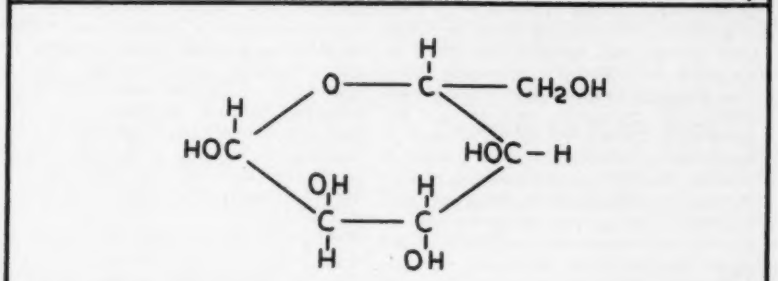
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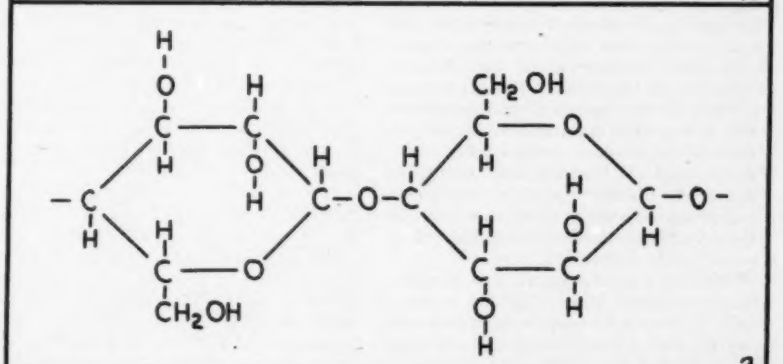
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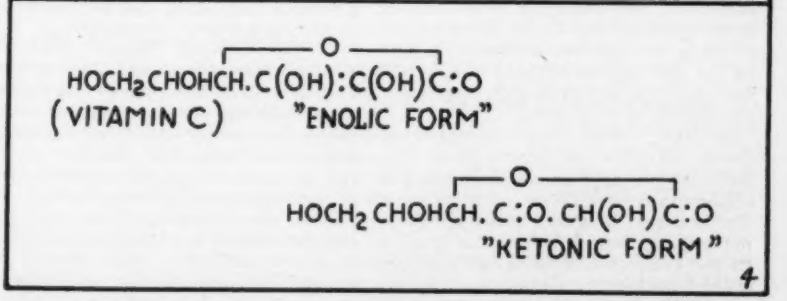

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I can simply be thankful that for the span of a few hours, my life was enriched by the personality and the proferred help of a great man.

Paul Karrer, I have never met in the flesh; but for a number of years I felt singularly close to him. We corresponded regularly, and with the greatest courtesy, he sent me, just as regularly, reprints of his articles published in the *Helvetica Chimica Acta*., which showed the high quality and amazing quantity of that earlier work. Those reprints with their bright-blue bordered bindings or their gray covers soon became associated in my mind with Karrer's seemingly limitless energy and ability. His work formed an important part of our departmental library at Syracuse, and it was often at my elbow.

When Karrer was announced as one of the prize winners for 1937, the newspapers reported that he was noted for his researches on carotinoids and flavins, and more especially for his work on the growth-promoting vitamin A, and the pellagra-preventative vitamin G. In fact his parallel ozonization experiments with pure carotene and with vitamine A led to a definite formulation of the chemical structure of the latter. The great similarity between vitamin G and lactoflavin was shown by the chemist Kuhn, and his co-workers several years ago. Then Karrer and his students definitely determined the constitution of the flavin. It is not my object to more than mention these brilliant achievements that led directly to the Nobel Prize.

What the newspaper reports failed to mention was the fact that for years on end, Karrer had worked on the chemistry of the carbohydrates, that he wrote an important monograph—*Die Chemie der polymeren Kohlenhydrate*, and that he spent countless months in his study of cellulose. It was this earlier work that led to our correspondence, and I still have a few letters from him that reflect his interest in that field.

In April, 1922, Karrer wrote from Zurich—"I have read with interest of a talk that you gave on the importance of a monograph on cellulose. I quite agree that is urgent that such a monograph be written, and especially one that gives a critical evaluation of the many researches in the literature." (Unfortunately in the year 1937, fifteen years after the above was written, we have no such critical monograph in the English language, certainly not under one cover. Dr. Stamm deserves the thanks of all workers in the cellulose field for his recent review on *Colloid Chemistry of Cellulosic Materials*. Dr. Haworth's review on the *Organic Chemistry of Cellulose* has been alluded to. But the complete monograph remains to be written.)

In 1923, Karrer wrote—"I am sending you another reprint, which you may find interesting in connection with your work on cellulose. When you reviewed Heuser's book *Cellulosechemie* for the *Journal of the American Chemical Society*, you slipped in a remark criticizing one of my researches. I should be interested to learn what criticism you have to offer." The specific work is not at hand, nor have I kept a copy of my letter replying to Karrer, but it seems that I had been somewhat skeptical about the work of Karrer on alkali cellulose, for in February, 1924, he wrote—"Thanks for your letter, the details of which I read with interest. Undeniably some of your criticisms would make it necessary for me to increase the number of my experiments. In the near future I hope to report on this. The hypothesis that alkaline solutions are adsorbed by cellulose has been rendered tenable only because cellulose has been looked upon as an isolated case, without considering its relationship to other similar polymeric carbohydrates. Most of the other polysaccharides like starch, mannan, lichenin, amylose, etc., when acted upon by alkali go directly into solution, and no one is tempted to speak of *adsorption*. Now the question is—Is this justified in the unique case of cellulose?"

It is obvious then that 10-15 years ago, Karrer was actively at work with cellulose and with related carbohydrates. His researches many of which were excellent and showed an amazing originality and a few of which led into blind alleys (whither at times all intrepid scientific explorers are led) showed Karrer's versatility and integrity as a research man. They gave indications of this thoroughness and of the gradual blossoming of a great creative imagination.

In 1921, when Haworth and Hirst were at work on the methylation of cellobiose, the characteristic sugar obtained from cellulose, Karrer and Widmer, in Switzerland, were grappling with the same problem, quite independently. Karrer's work on alkali cellulose has been mentioned but it may be of interest to cite just a few of the problems that held his interest in those earlier years. He worked on the fermentative degradation of lichenin (the so-called "reserve cellulose") making a thorough study of the enzymes that split it, and the pH and the kinetics of these cleavage reactions. He showed that cellulose reprecipitated from supramonium solutions was attacked by the enzyme isolated from the digestive tract of the edible snail *(Helix pomatia)*, and that the reaction followed the same general course as that taken by the hydrolysis of reserve cellulose. His interests also entered the field of the chemistry of starch, its alkali derivatives, its methyl derivatives, its indirect conversion into maltose. Further enumeration is unnecessary. All this work became very interesting to us at Syracuse, as our own work began to take some form.

Since those earlier years, Karrer's work has expanded enormously and his horizons have widened. His Institut at Zurich became the mecca of an army of research workers. A few years ago, he wrote an excellent text in organic chemistry, and of course his work on the vitamins is classical. But it is good to know that we have Karrer's older and less well-known work on cellulose and the polysaccharides and that I have an autographed copy of his monograph on the polymeric carbohydrates.

Karrer's letters show that he must be a genial and very patient person. When he wrote them, he was hard at work, while my own output was a very meagre one. I had plenty of time to be critical, while he was creatively active. But he took the criticisms of a very inactive colleague in good part. In fact he was gracious enough to give the impression that he took them seriously.

Walter Haworth and Paul Karrer have been recognized by the world. No two living organic chemists deserve this recognition more than do these two eminent, modest men.

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## ◆ Heuser Joins Institute of Paper Chemistry

One of the most outstanding appointments which it has been the privilege of The Institute of Paper Chemistry to announce in recent years is that of Professor Doctor Emil Heuser as Research Associate and Instructor in Cellulose Chemistry, who will assume his duties at the Institute on March 1, 1938. Dr. Heuser brings with him an unusual combination of theoretical and practical knowledge, both of cellulose chemistry and pulp and paper making, as well as of rayon and its manufacture.

Dr. Heuser's early training was obtained at the Technical University of Munich and of Karlsruhe, where he studied under such well known chemists as Bunte, Engler, Haber and Le Blanc. He worked for his doctor's thesis at the University of Graz (Austria) thereafter returning to the University at Karlsruhe to obtain his doctor's degree under Scholl in 1909.

Following his graduation, Dr. Heuser spent three years in practical work in various paper mills in Germany and Austria. In 1912 he received a call to the Chair of Cellulose Chemistry at the Technical University of Darmstadt. In Darmstadt Dr. Heuser gave lectures on organic chemistry, on the chemistry of cellulose and on the chemical technology of pulp, paper, dyes, textiles, etc. With the assistance of graduate students, he carried on many original investigations both on the theoretical and practical sides of cellulose, lignin and non-cellulosic carbohydrates, as well as on pulping, bleaching and problems pertaining to the manufacture of paper.

During 1916-1918, he was engaged in a study of the industrial utilization of cellulose and other wastes, the main problem considered being the fermentation of sulphite waste liquor, the production of methyl alcohol, acetone and other solvents by the Rinman process, and the manufacture of furfural from wood waste and straw.

Dr. Heuser resumed his duties at the University at Darmstadt in 1918 where he remained until 1923. The next three years were spent as Director of Research of the "Vereignigte Glanzstoff-Fabrikon" (manufacturers of rayon and photographic films), during which time he was also honorary professor of cellulose chemistry at the University of Berlin in Charlottenburg.

In 1926, when the manufacture of rayon pulp became a pressing problem in North

America, he accepted the position of Director of Research of the Canadian International Paper Company, Hawkesbury, Ontario, which position he leaves to assume his new duties at the Institute.

Dr. Heuser is a well-known contributor to paper trade literature and was the founder (and from 1920-1926, the editor) of *Cellusechemie* which was combined with *Der Papier-Fabrikant* in 1937. He is also the author of a large number of research papers. Dr. Heuser is a member of many foreign and American chemistry societies. He was chairman of the Cellulose Division of the American Chemical Society from September 1936 to September 1937.

### ◆ C. H. Morian Now President of Cherry River Company

Succeeding the late Fred L. Space as president of the Cherry River Paper Company, Philadelphia, is Clarke H. Morian, formerly vice-president and sales manager of the company. Supplementing this announcement was news of the appointment of E. L. Dakin as vice-president, succeeding Mr. Morian. J. M. S. Ewing has been named sales manager of the company.

Mr. Space, who passed away November 24, 1937, at the age of 72, was, in addition to his executive post at the Cherry River Paper Company, president of the Cherry River Boom and Lumber Co., the Andrews Hardwood Company, Andrews, N. C., and the Everglade Cypress Company, Lougbman, Fla.

### ◆ Michigan Supers-Tappi Men to Hold Important Meeting

A closer relationship than ever will be established between the Michigan Division of the American Pulp and Paper Superintendents' Association and the Kalamazoo Valley Section of T.A.P.P.I. when the two groups meet in a joint session, Thursday, January 20, at the Park American Hotel in Kalamazoo.

Much credit is due to Committee in Charge of Arrangements, which includes Wm. Mathaway, Paul de Guehry and Frank Whittington of the T.A.P.P.I. and Dan Stacey, Lester LaLiberte and A. B. Perlick of the Superintendents' Association, for its efforts to insure the success of the annual meet. Of special import to printers and paper dealers, who are invited to the meeting, is the topic by Robert F. Reed, head of the Lithographic Foundation, Cincinnati, Ohio, entitled, "Lithography and Printing Paper in General."

### ◆ New Cellulose Material

Pervel, the new cellulose material, is made from Solka, a purified cellulose fiber created by Brown Company, Portland, Maine. Just as Solka is used in the making of Cellophane, moulded plastics and leather-like materials, so is it used as a base in the making of Pervel Materials.

Pervel Material is soft and cool, with a pleasant feel somewhat between those of percale and broadcloth. It is absorbent, strong when wet, resists dirt, drapes nicely, can be printed in colors and made water-repellent. It can be fabricated into bed and table linen; babies' bibs and diaper linings; window curtains; shower curtains; fancy costumes; handkerchiefs and other articles of general use. There are also products for dentists; physicians; hospitals; clinics; institutions; colleges; barbers; butchers; restaurants and hotels. All of these are intended to sell at less than the cost of laundering.

Pervel Material is manufactured and controlled by Pervel Corporation; 11 West 42nd Street, New York, and is protected by a combination of basic patents and formulas.

### ◆ Exhibition to Feature Display of Currency

Extensive plans are already under way for the Golden Gate International Exposition which will be held in 1939 on Treasure Island in San Francisco Bay.

One of the attractions of the exposition will be the "Good Earth Village," replica of an ancient walled city. The village which will cost $1,200,000 will have quaint dwellings, shops, markets and the stalls of the money changers will be reproduced in authentic detail.

A pagoda which will rise from the center of a Chinese garden will have each floor devoted to some phase of China's contribution to civilization. On one floor there will be a display of early currency which will tell the story of the Chinese evolution of paper money, including cash certificates, gold banknotes and the equivalent of checks and bonds. Part of this currency display will deal with the old battle against counterfeiting. Examples of counterfeits dating back to the earliest known instances of currency counterfeiting which appeared in 1068 are expected to be included.

### ◆ Dr. Thorne Awarded Diploma By Norwegian Association

Dr. C. B. Thorne, vice-president of the Canadian International Paper Company, was honored by the Papirindustriens Tekniske Forening (Technical Association of the Norwegian Industry) on December 2 in Montreal, when the Norwegian organization presented him with an artistically designed diploma covering his appointment as Honorary Member.

The diploma, citing Dr. Thorne and thanking him for his "outstanding contribution towards the advancement of cellulose technique and the pulp industry," was presented by Norwegian Consul General Daniel Steen at the request of the Association and of the Norwegian Foreign Office and in the presence of Dr. Thorne's personal friends and official diplomats.

### ◆ Rumor of Cigarette Paper Mill for North Carolina

Rumors that western North Carolina may be the site of a six million dollar cigarette paper mill have been circulated freely in that section.

Giving impetus to the rumors, the *Reidsville Review*, Reidsville, N. C., recently stated that "some community in western North Carolina is likely to be selected soon as the location of the plant." The newspaper pointed out that Fred L. Weede, manager of the Asheville, N. C., Chamber of Commerce, has been supplying representatives of a French company with information relating to the water supply. The French company was described as "one of the largest cigarette paper manufacturing concerns in the world." Mr. Weede, however, disclosed that while engineers have been investigating the surrounding region in regards to water supply, nothing definite has been decided upon by the company and very few details have been revealed about the rumored project.

### ◆ G-E "Test" Men Unite for Re-Union Via Short Wave

Members of the General Electric Test Alumni Association, which is composed of graduates of engineering colleges who have taken the G. E. "test" course, celebrated their third annual re-union December 9 as many of the more than 7,000 "test" men, scattered all over the world, gathered in groups to listen to the international broadcast, which was a part of the celebration.

Greetings were sent to fellow grads in remote sections of the world by officers and prominent members of the Past Test Men's Association by means of a short wave broadcast from Schenectady. The program was carried by international broadcast station W2XAS, 15,330 kilocycles or 19.56 meters and W2XAF, 9,530 kilocycles or 31.48 meters.

It has been estimated that approximately 15,000 men from 200 schools have passed through "test" and the various student engineering courses of G-E predecessor companies. Of the active alumni, 2,600 are with the company and 4,300 are outside in every walk of life. The great majority, however, have remained in the electrical industry.

### ◆ Re-Issue Seaborne Patent

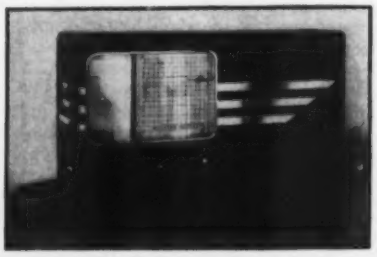
American Lakes Paper Company, owners of the Seaborne Patent No. 1,517,018, Paper Making Machine, advise that this patent has been re-issued. The amended patent, which takes effect on December 28, 1937, covers the Seaborne rubber marking roll equipment which has been extensively used by the American Lakes Paper Company and Thilmany Pulp and Paper Company since 1923 in connection with the manufacture of stripe marked and design marked wrapping papers.

### ◆ Box Manufacturers Ass'n to Meet in Cleveland

The Twentieth Annual Convention of the National Paper Box Manufacturers Association will be held at the Hotel Cleveland, Cleveland, Ohio, May 22-25, 1938. Alfred S. Andrews of the Great Lakes Box Company, Cleveland, is general convention chairman and Samuel Grunsweig, Apex Paper Box Company, Inc., is treasurer. An attendance of about 400 is expected. This is the fourth time since the organization was formed, that Cleveland has been chosen for the annual meeting.

## ◆ Continuous pH Recorder

An automatic pH recorder which uses a glass electrode has been announced by Wilkens-Anderson Company, 111 North Canal St., Chicago, Ill. This recorder, which is simple in design, is designated as the Cameron, it being developed and patent application made for it by Dr. D. H. Cameron of the B. D. Eisendrath Memorial Laboratory, Racine, Wis. In operation, a sample of the material being tested is withdrawn at fixed intervals by a sampler. Frequency of withdrawal by the sampler, which consists essentially of a valve that is operated by an electric clock, is determined to meet specific needs. Each sample, conducted from the sampler to the electrode bulb, causes a potential to be developed by the electrode, this potential being transmitted to the recorder. Only the sampling mechanism and the electrode need be located at the point of test. The recorder can be mounted anywhere within a reasonable distance for greater convenience in reading. The record is made upon ordinary 8½ in. x 11 in. co-ordinate paper and may cover a 5, 10 or 20-hour period as desired. Simply substituting a threaded carrier screw with a different pitch changes the recording period. In producing the record, the recording pen rises



to the exact reading of the pH in the sample, following which it withdraws about $\frac{1}{16}$ in. and then slowly oscillates between the two points thus established while the sample is in the bulb. Back lash or other mechanical errors, according to the manufacturer, are eliminated by this approach to the point of record. The recorder may be used in the presence of oxidizing or reducing materials, in chlorine liquors, and in heavily colored solutions. Available attachments also permit a single recorder to be used for multiple recording, such as the recording of the pH of stock in each of the several vats of a multi-cylinder papermaking machine and for automatically opening and closing valves on alum feed lines.

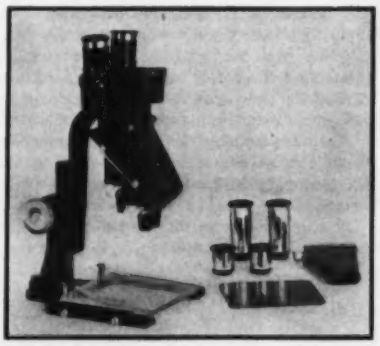
## ◆ Roll Handling Attachment

The Baker-Raulang Company, Cleveland, Ohio, has announced a motorized roll handling attachment for its standard narrow carriage, fork-type trucks. The attachment, available in capacities up to 6,000 lb. and for rolls up to 50 in. in diameter, consists, in part, of a scoop or cradle that is fabricated from formed and arc welded high-carbon steel plate. This scoop, fastened to a heavy ball-bearing trunnion block and upon which it rotates, is adjustable on the trunnion so that rolls of varying lengths may be centered. A standard Baker ball bearing, totally enclosed motor rotates the cradle through a gear train and a roller chain and sprocket system. The motor controller is mounted on the truck chassis and has a spring return to neutral for safety; while multiple-conductor

cable to the motor is provided with a multi-point quick-connector plug to permit connections to be easily broken or re-made when the attachment is removed or applied to a truck. Use of the attachment permits rolls of newsprint, kraft or other paper to be picked up on end or on the side, rotated 90 deg., and stored or tiered in either position.

## ◆ Wide Field Binocular Microscope

A new wide field binocular microscope, designated as Model K, has been introduced by Bausch & Lomb Optical Company, Rochester, N. Y. The body of this microscope is of the regular Greenough binocular type, adjustable for interpupillary distance, while the stage is equipped with a removable glass insert and a removable white and black metal plate. A special feature of the instrument is a dustproof shuttle nosepiece which carries any two pairs of objectives in parfocal position except the 0.39x or 0.7x objectives, the full range of objectives



and eye pieces covering working magnifications of 2.34 to 15 diameters.

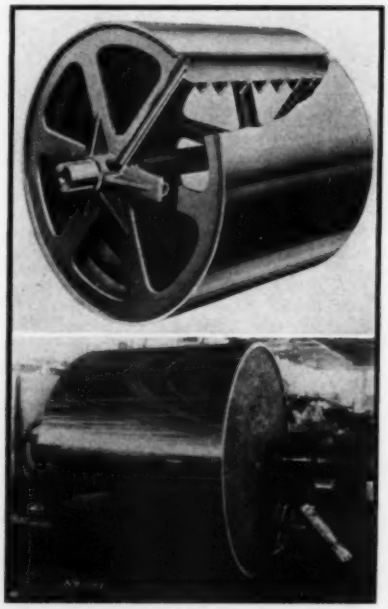
The microscope can be placed directly on the work or it can be equipped with a base carrying a fork-mounted mirror for transmitted light, and a pair of arm rests to steady the hands while working on the specimen.

## ◆ Electrode for Small A. C. Welder

A mild steel arc welding electrode, designated "Transweld" and designed particularly for use with small alternating current transformer type arc welders, has been announced by The Lincoln Electric Company, Cleveland, Ohio. The electrode has a very heavy extruded coating and a very stable arc. It is made in $\frac{3}{32}$, $\frac{1}{8}$ and $\frac{5}{32}$ in. sizes, the $\frac{3}{32}$ in. size being 12 in. long, the other two sizes, 14 in.

## ◆ Steel Dryer

A dryer with a shell of close-grained steel and with heads welded to the shell has been introduced in the paper industry by Lukenweld, Inc., Division of Lukens Steel Company, Coatesville, Pa. In its ordinary form, the dryer conforms essentially to the conventional cast iron dryer; but, for higher pressures and larger diameters, it is of double shell construction with the area between the shells being divided into compartments.



The dryer is available in sizes up to 15 ft. in diameter and for pressures up to 150 lb. It may or may not be chromium plated.

Among the advantages claimed for the dryer by the manufacturer are: controlled steam distribution, higher steam pressures, less steam consumption, clean surface, and lighter weight.

## ◆ Portable Brinnell Testing Outfit

A light-weight, portable Brinnell testing outfit, known as the Telebrinneller, has been announced by Teleweld, Inc., Railway Exchange Bldg., Chicago, Ill. The complete outfit, weighing only 6½ pounds, includes a Telebrinneller instrument, a microscope with a scale etched in its focal plane and a slide rule to-

gether with two extra test bars, three impression balls and a carrying case.

The instrument itself consists of a metal tube, a bar of known hardness, a soft rubber head, a rubber spacing block, an anvil, and an impression ball. The tube, holding the bar of known hardness, is supported by the soft rubber head and the rubber spacing block. The anvil is located in the top of the rubber head and rests directly on the bar, while the impression ball is secured in a narrow aperture in the base of the head below the bar and comes in direct contact with the metal to be tested. The spacing bar, operated by a spring catch and button, holds the test bar in a clear area for each test, a total of 80 impressions being possible for each bar.

The instrument, in making a test, is held against the specimen while the anvil is struck a sharp blow with a 3 to 5 pound hammer. The impact of

the blow is transmitted through the anvil to the bar, then to the ball, and on to the specimen.

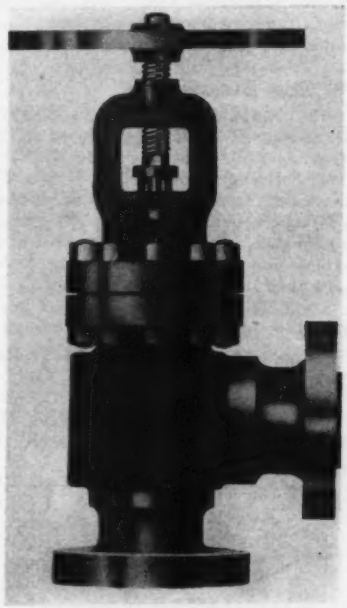
Diameters of the impressions in the test bar and the specimen are then measured in 1/10 millimeters by placing the microscope over each in turn and reading the scale; and the Brinnell hardness number (BHN) calculated from these impression diameters through the use of a simple arithmetical formula or a slide rule.

Among the suggested applications for this instrument in the pulp and paper industry would be its use for testing the hardness of metal calender rolls, beater flybars, jordan fillings, and chipper knives. Numerous other applications are also possible.

## ◆ Forged Steel Stop Valve

Clees Valve & Engineering Company, New York, N. Y., has announced a new stop valve for high pressure service. This valve, made in both angle and offset types of hammer forged chrome molybdenum steel in sizes from 2½ in. to 8 in. and for pressures up to 2500 lb. per square inch, can be furnished with flanged ends or with ends prepared for any type of welding. All seats are Stellite faced. Bolting is of class "C" A. S. T. M. steel. Trim is of stainless steel.

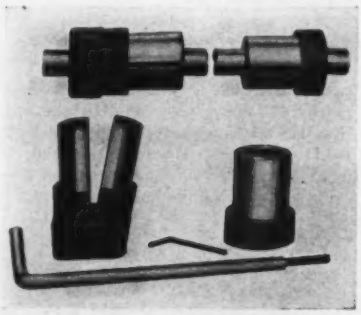
An unusual feature of the offset valve, which is of the unidirectional type, according to the manufacturer, is that its pressure drop approaches that of a gate valve and is considerably less than the



drop in other types. The valve also is provided with a special internal by-pass which is stated to be a desirable feature in the larger sizes when used in high pressure service.

## ◆ Jumbo Roll Expanding Chuck

Paper Converting Machine Company, Green Bay, Wis., has announced a jumbo roll expanding chuck for use with a 3-inch core and for a roll shaft of 1⅞ in. in diameter or larger. The chuck, made of machined castings and with no pro-



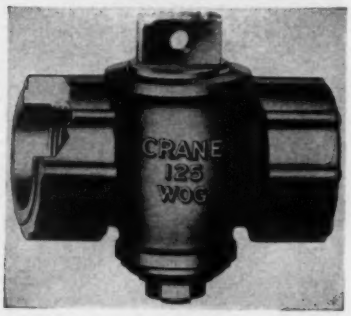
jecting screws, expands on the inside of the core, and, when tightened, bears on the shaft at four points. Ease of application, no cracked cores or spoiled paper, positive tension, and safe to operate are the advantages cited for the chuck by the manufacturer.

## ◆ Corrosion-Resistant Plastic

American Concrete and Steel Pipe Company, Box 1428, Arcade Station, Los Angeles, California, has announced the development of a corrosion-resistant plastic which can be sprayed on concrete, steel or wood with a paint-spray apparatus. The plastic, know as Amercoat, is naturally colorless, but it may be pigmented to practically any color or shade, if desired.

## ◆ Cock with Recessed Ends

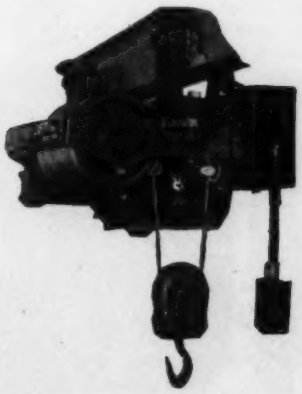
Crane Co., 836 South Michigan Ave., Chicago, Ill., has added a new cock with recessed ends to its regular line of iron gas line cocks. The recess at each end is sufficiently large to cover the entire threaded surface. When the recesses are filled with a lubricant or paint to seal




the space between the pipe and the inside of the cock opening, it protects both the cock and the pipe threads from outside contamination. The cock is made with flat head, brass plug and washer, and body of galvanized iron in ¾, 1, and 1¼ in. sizes. It is recommended by the manufacturer for a non-shock working pressure of 125 lb. on cold water, oil, air or gas.

## ◆ Rope Guide Hoist

Electro Lift, Inc., 30 Church Street, New York, N. Y., has announced a hoist which has been designed for use wherever a hoist cannot be brought directly over a load. This hoist has a deeply grooved drum and a traveling guide to insure



proper positioning of cable in drum grooves. Built in sizes of ¼ to 5 tons and in both single and twin hook types, it has a worm drive with worm and wheel running on Timken roller bearings within fully enclosed gear case and in a bath of oil, a ball bearing equipped motor that is

attached directly to hoist frame, and a safety type hook block with a guard which completely encloses the bottom sheave. Control may be either by rope or push button. Top and bottom limit switches also may be provided to stop the load in each direction of travel.

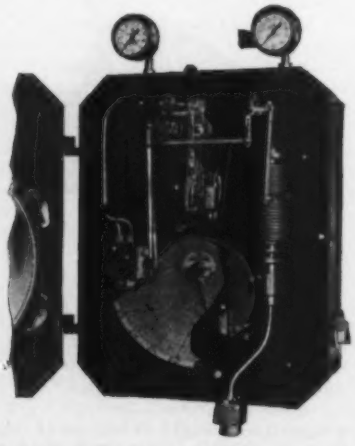
### ◆ Fibre Lagging for Pulleys and Flywheels

Rockwood Manufacturing Company, 1801-2001 English Avenue, Indianapolis, Indiana, has announced a new fibre lagging for use in increasing the diameter of pulleys and flywheels. This lagging,

made of the same material as Rockwood paper pulleys, is supplied in any width and in diameters up to 72 in. Application is made on the wheel rim through an improved clamp. The lagging is said to reduce belt tension and to increase drive capacity.

### ◆ New Line of Absolute-Pressure Instruments

Taylor Instrument Companies, Rochester, N. Y., have announced a new line of instruments for indicating, recording and controlling absolute pressure. The absolute pressure element consists of a



flexible phosphor-bronze bellows to the inside of which the pressure medium under measurement is communicated. Connected with this assembly, and opposing its action, is a second identical metal bellows which has been evacuated and sealed, thus comprising an atmospheric-pressure compensator. Paper mill applications, which have been suggested for the instruments, include their use on suction box headers, suction couch rolls, suction press rolls, supply and condensate heads, and evaporators in sulphate pulp mills.

### ◆ Belt Dressing

The National Oil Products Company, Harrison, N. J., has developed a belt dressing for application to leather belts. This dressing, designated as Nopco 1919, according to the manufacturer, contains no rosin, asphalt or similar belt gripping compounds, but rather is composed of oils which nourish and preserve the leather and keep it from drying up.

### ◆ Air Moistener

A device, designated as the humidity box, has been designed and built by The Air Conditioning Supply Company, 1893 East 55th Street, Cleveland, Ohio, for the introduction of moisture into

spaces warmed by unit heaters. The manufacturer suggests that the frictional resistance to the flow of air through the device is so extremely low that it may be used with equal success to counteract the drying effect of propeller fan type unit heaters.

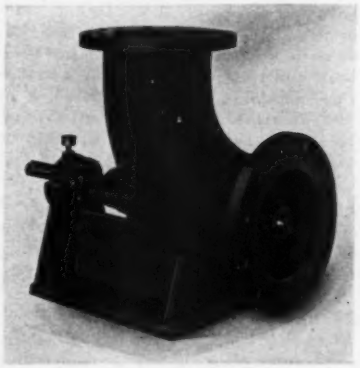
### ◆ High Pressure Pump

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has introduced an improved design of multi-stage pump into the high pressure boiler feed pump field. This pump is called the DOUBLETON because of its double suction impellers, and the double balance of its rotat-

ing element. The double suction impellers provide axial balance; and the positions of the successive volute passages, which surround each impeller, largely equalize unbalanced radial forces on the impellers. The pump is made with a horizontally split casing for pressures of 1500 lb. and above.

### ◆ Elbow-Propeller Type Pump

Worthington Pump and Machinery Corporation, Harrison, N. J., has developed an elbow-propeller type pump to handle water, paper stock, liquors and



the like. The pump, suitable for any type of drive, and built in capacities from 1,000 to 2,000 g. p. m. at heads up to 20 ft., may be installed in pipe lines for booster or circulating service.

### ◆ Charles Wilson Elected Vice-President of G-E

Beginning work with the General Electric company as an office boy 38 years ago and having served in practically every function of the business, Charles E. Wilson, vice-president in charge of General Electric's appliance and merchandise department, has been elected executive vice-president of the company.

Co-incident with this announcement was the news that Phillip D. Reed, general counsel of the lamp department, has been elected as assistant to the president. Mr. Reed has been with General Electric since 1926. He is a graduate of the University of Wisconsin and Fordham University.

### ◆ South African Company to Produce Pulp from Bagasse

A new company, registered in Durban, South Africa, under the name of Universal Cellulose (Pty.) Ltd., will exploit a secret process for the manufacture of pulp from cane bagasse, according to a report found in the *Natal Mercury*. The process, which belongs to E. A. Ritter of Natal Estates, Ltd., was used to produce newsprint a few years ago, the report stated. Several copies of the *Mercury* were printed on it at the time.

### ◆ Propose Recommendation for Sizes of Spice Packages

A proposed simplified practice recommendation covering sizes of spice packages and containers (tin and fiber) has been mailed to spice grinders, distributors of spices, container manufacturers and others interested, by the Division of Simplified Practice of the National Bureau of Standards, for consideration and acceptance. The recommendation lists 8 sizes of packages ranging from

1 ounce to 16 ounces, net weight; with a maximum capacity of containers ranging from 80 to 950 cubic centimeters, respectively.

### ◆ Dr. F. J. Tone Receives Chemical Society Medal

The Perkin Medal for the most valuable work in applied chemistry during the year, was awarded to Dr. Frank J. Tone, president of the Carborundum Company, at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society held at the Chemists' Club, New York City, January 7. The medal was awarded to Dr. Tone for his work in the field of abrasives and refractories.

James G. Vail, chairman of the American Section, presided over the meeting and the presentation was made by Professor Marston T. Bogert. Dr. Tone gave his medal address, entitled, "The Quest for Hard Materials". A dinner in honor of Dr. Tone preceded the meeting.

◆ NORMAN BROWN, of Brown Company, Portland, Maine, has been elected a vice-president of Pervel Corporation, New York City. The latter company manufactures cellulose material, using Brown Company's Solka pulp as a base.

### ◆ Florida Honors Dr. Herty

Leading industrialists, financial and editorial figures are to gather in Fernandina, Fla., on January 14, as guests of Florida's Governor Fred P. Cone, to pay tribute to the work of Georgia's famed Dr. Charles H. Herty.

The first unit of the Container Corporation of America's $9,000,000 Fernandina mill will be formally launched at this date when Walter P. Paepcke, president of the Container Corporation, unveils a plaque inscribed to Dr. Herty. Eight governors from as many southern paper-producing states will take part in the ceremonies, which will be broadcast on a nationwide hook-up.

◆ VISCOUNT ROTHERMERE has resigned as director of the Anglo-Newfoundland Development Company, it was announced recently. The company was formed to acquire the undertaking and assets of a company of the same name organized in 1905 to erect pulp and paper mills in Newfoundland to supply the *Daily Mail* and associated companies with newsprint.

### ◆ E. A. Oberweiser Leaves Whiting-Plover Company

E. A. Oberweiser, president and general manager of the Whiting-Plover Paper Co., Stevens Point, Wis., is severing all connections with the company and is selling his minority stock interest, it was announced recently by the company. All stock in the company will be held by Whiting interests.

Succeeding Mr. Oberweiser as president is Frank B. Whiting, son of the firm's founder, George A. Whiting, and formerly vice-president of the company. Joseph H. Miller, formerly assistant general manager, will be vice-president and general manager. George Hilton will continue as secretary and George A. Whiting, son of Frank B. Whiting, will be treasurer. C. W. Spickerman will be general sales manager.

The company wishes to announce that notwithstanding many rumors to the contrary, all stock of the Whiting-Plover Paper Company will be owned and controlled by the Whiting interests, who have controlled its management and majority stock holdings since it was first founded.

◆ K. A. FORREST, having completed his work with the Crossett Paper Mills in connection with the construction and organization of their new 200 ton plant at Crossett, Ark., is no longer active with the company. In the construction of the mill Mr. Forrest applied several new ideas not heretofore used in paper mill designing.

### ◆ Silco De-Inking Unit Ready to Operate at Andrews Mill

The first commercial de-inking unit manufactured by the Silco Pulp Products Company, 1836 Euclid Avenue, Cleveland, Ohio, will go on production schedule of de-inking waste paper about January 15 at the O. B. Andrews paper mill, Chattanooga, Tenn. E. H. Silberman, president of the Silco company, has announced that all test runs have been satisfactory and that the unit is now ready to commercially de-ink all grades of waste paper at a low cost.

◆ OPERATIONS WILL COMMENCE at the Whakatene Paper Mills, Ltd., mill, loated in Auckland Province in the North Islands, New Zealand, before June 20, 1938, according to a recent report. This mill is the second paper establishment in New Zealand. Its financial statement, just issued, states that the erection of a £500,000 pulp and paper plant is well under way.

### ◆ New Polish Sulphite Mill

A large sulphite plant has been erected in the vicinity of Miscice, Poland, to satisfy the demand for high-grade sulphite pulp required by the rayon, artificial fiber and explosives industries.

Experiments and research conducted over a period of years has led to the discovery that specially prepared chemical pulp from fir wood may be used in place of cotton linters and it is expected that with the establishment and consequent operation of the new sulphite plant, the importation of cotton linters and high-grade sulphite will be discontinued. The total cost of the plant is reported to be about 11,000,000 Zlotys (zloty equal to about 19 cents).

### ◆ William Garbe

William R. Garbe, vice-president and general manager of Love Brothers, Inc., Aurora, Ill., passed away December 9 at the age of 60. Mr. Garbe was born in Germany and had been connected with Love Brothers for 34 years. For four years he was a member of the Aurora board of public works. Surviving Mr. Garbe are three children; one son and two daughters.

### ◆ To Erect New Chemical Pulp Mill In Germany

A new company, under the name of Schwaebische Zellstoff und Zellwolle, has been established in Wuerttemberg, Germany, and will manufacture chemical pulp for use in the textile industry. The company plans to start erection of the mill in the spring of 1938 and to begin operations by the end of the year. It is understood that the pulp is to be manufactured from beech wood and that the annual production will be in the neighborhood of 20,000 metric tons. The capital stock of the concern is reported to be 6,000,000 Reichsmark (RM-.4038 cents U. S. Currency), one-half of which has been subscribed by local textile enterprises.

In addition the new company proposes to undertake the construction of a factory for the production of artificial fiber as soon as practicable after the completion of the chemical pulp plant.

◆ JOHN MILAM has resigned as paper mill superintendent of the Union Bag and Paper Corporation's Savannah plant and is now associated with Richard Laftman, general manager of National Container Corporation's Jacksonville, Fla., mill. A. F. Downey has succeeded Mr. Milam at the Union Bag plant.

### ◆ Erect Sulphite Mill In Strasbourg, France

As a part of the program now under way to supplement France's consumption in sulphite pulp, sulphite plant has been erected at Strasbourg. The plant, which is located between the Vauban basin and the Petit Rhin, near the Strasbourg power plants, will have an annual productive capacity of 30,000 tons. The company expects to obtain the greater part of the wood locally from the Vosges district, deficiencies to be made up by imports, principally from Russia.

The plant installation includes four pyrite ovens and a tower for transforming the sulphur anhydride in connection with the production of bisulphite. The paper mills in Alsace have been securing their sulphite requirements from Germany, but within the last year or two have experienced some difficulty in obtaining sufficient supplies from that country.

◆ THE ALL-OHIO STATE SAFETY CONGRESS will be held May 10-12 at the Deshler-Wallick Hotel in Columbus, according to a decision made recently at a meeting of the general committee. A. W. Olzey of the Fairfield Paper Co., Baltimore, Ohio, is chairman of the pulp and paper section of the congress.

## ◆ New Catalogues and Publications

**Abbe Engineering Co.,** New York, N. Y.—A new bulletin (No. 43) describing the Abbe-Lenart mixers has just been released by this company. Using photographs to good advantage, this publication illustrates the operating principle and uses of the apparatus in its various applications.

**American Concrete and Steel Pipe Co.,** Los Angeles, Calif.—This bulletin describes the various uses and applications of the company's corrosion-proof sprayable plastic coating for concrete, steel or wood. Photographs aid the written material in presenting each specific use of the product.

**Bausch and Lomb Optical Co.,** Rochester, N. Y.—Of interest to the paper technologist is the new bulletin issued recently by this company entitled *Optical Control for the Paper Technologist.* The bulletin describes the construction and uses of the various types of optical equipment for use in the paper industry, by means of written material, photographs and specification tables. Price lists are also included.

**Brown Instrument Co.,** Philadelphia, Pa.—Two new publications have been issued recently by this firm. One, which has to do with automatic boiler regulation (No. 5001), is a 24-page bulletin covering completely the construction and uses of the company's steam damper regulator, overfire control, and the various component parts of the apparatus. The other bulletin describes in a graphic manner, the multicolor numeral recording features of the company's potentiometer pyrometers. Both publications are fully illustrated.

**Commercial Shearing and Stamping Co.,** Youngstown, Ohio—A recent bulletin issued by this company describes the tank heads, tank accessories, boiler heads and stampings manufactured by the firm. The bulletin, 28 pages in length, gives a complete picture of the design and uses of the products by means of written explanatory material, photographs, diagrams and specification tables.

**Dilts Machine Works, Inc.,** Fulton, N. Y.—This company's bandless beater roll is described in a new folder released lately. Various features of the roll, including keyed type fly bars, are illustrated by means of photographs and concise reading matter.

**Foster Wheeler Corp.,** New York, N. Y.—Pertinent to the paper industry are the two new bulletins released lately by this company. Bulletin ID-37-13 is devoted to digester condensing systems and explains the arrangements necessary for blowdown heat recovery, relief heat recovery and turpentine recovery. The other publication (No. ID-37-12) is concerned with indirect digester heating and circulating systems. Both issues are punched for loose-leaf filing and both contain photographs and diagrammatic drawings in addition to the detailed written material.

**Foxboro Co.,** Foxboro, Mass.—A new bulletin just issued by this company describes special flow meters for high pressure measurement. In addition to the descriptive literature, two sectional views of the flow meters are included in the publication.

**Holcomb Safety Garment Co.,** Chicago, Ill.—Various styles of safety garments are described and illustrated in a new 32-page catalogue recently issued by this firm. The different types of leggings, mittens, gloves, sleeves, aprons, etc., designed for protection of the worker are presented by means of photographs.

**Ingersoll-Rand Co.,** Phillipsburg, N. J.—Thirty pages long and replete with photographs and diagrams, this bulletin (Form 9144) gives a complete picture of the centrifugal water-vapor refrigeration system developed by this company. The bulletin describes the problems confronted in water-vapor refrigeration and explains the application of the unit, in addition to its construction. Included also are several installation views.

**International Nickel Co., Inc.,** New York, N. Y.—Several new bulletins have been released lately by this company. Bulletin T-14 deals with design and construction of heavy equipment in Monel nickel and Inconel while Bulletin T-13 is concerned with nickel and nickel-base alloys. Both of these publications contain much valuable technical information on their respective subjects. Both are punched for loose-leaf reference and both contain many photographs, tables and diagrams relative to the subject. In addition, this company has compiled a list of current literature on nickel alloy steels, nickel cast irons, nickel brasses and bronzes and other nickel alloys. This classified catalogue is available from the Nickel Sales Department of the company.

**Leeds & Northrup Co.,** Philadelphia, Pa.—An interesting new catalogue (No. N-33-163) pertaining to the company's "Micromax" temperature instruments for the steam plant, has been issued recently. The publication, covering steam-plant measurements from boiler furnace to turbine, is well-written and illustrates the company's instruments to good advantage, through the extensive use of photographs, diagrams and sectional drawings. The book is offered to executives, engineers and operating men concerned with steam generation, whether in central stations or industrial plants.

**Mathieson Alkali Works,** New York, N. Y.—An attractive new booklet, 36 pages in length, has been published recently by this company. The booklet briefly traces the development of the company from its beginnings until the present. Flow charts outline the processing operations at the company's different plants and a section devoted to the company's products gives the reader concise information and package specifications on a wide variety of products. Many fine photographs are featured throughout.

**Mine Safety Appliances Co.,** Pittsburgh, Pa.—This company has recently issued a new booklet entitled *Pertinent Questions and Answers Concerning Dusts,* which explains in simple, non-technical language, the nature and effects of dusts in regard to human health. Various types of respirators are described in the publication.

**Northern Equipment Co.,** Erie, Pa.—This bulletin (No. 409-A) explains the principle of the Copes flowmatic regulator; a two-element steam-flow type automatic boiler feed water regulator. The regulator is graphically described by means of graphs, photographs and multi-colored cross-sectional diagrams. Written matter explains the installations and functions of the apparatus.

**Norton Co.,** Worcester, Mass.—The D-86 crankpin grinder manufactured by this concern is amply illustrated in a new brochure recently issued by the company. Features of the machine are made clear by the use of detailed photographs.

**Patterson Foundry and Machine Co.,** East Liverpool, Ohio—This new bulletin illustrates and describes the company's laboratory and pilot plant equipment. The various pebble, ball and tube mills, mixers, kettles, autoclaves, filter presses, dry and wet pans and clay and mineral working machinery are presented by means of photographs and briefly-written matter.

**Process Engineers,** Mount Vernon, N. Y.—An informative booklet dealing with the principles of sizing paper with rosin, has been issued lately by this organization. Written by J. A. DeCew, of Process Engineers, the booklet presents, in condensed form, the art of paper sizing using rosin as the waterproofing agent. Of special interest are the ten axioms, submitted by the author, as being applicable to all types of rosin size in their application to paper fibers.

**Pyrometer Instrument Co.,** New York, N. Y.—This company's new "Pyro-Micro-Optical" pyrometer, a precision instrument for measuring the temperatures of very small objects such as incandescent lamp filaments, etc., is fully described in a recent bulletin issued by this company. The bulletin (No. 90) is clearly written and contains several illustrations of the instrument.

**Rockwood Manufacturing Co.,** Indianapolis, Ind.—This company publication, *The Rockwood Record,* is given over to the description of the various motor drives and paper pulleys manufactured by the company. The edition is replete with photographs, which aid the regular written material and the graphs in explaining the design and application of the machinery. An interesting feature of the publication is that concerned with the presentation of the results of various field and laboratory tests made with the company's paper pulleys.

**Joseph T. Ryerson and Son, Inc.,** Chicago, Ill.—A truly fine contribution is the new, de luxe publication of this company. Spiral-bound and measuring 10⅜ x 15, the book is the complete story of the recently announced Certified Steel Plan. The publication is note-worthy because of its clear portrayal of the plan and also because of its splendid photographs, some of them full page size, which trace every step of the system whereby it is possible to obtain uniform and quality controlled steel for immediate shipment from stock. This publication would be an extremely valuable addition to any industrial library.

**C. J. Tagliabue Manufacturing Co.,** Brooklyn, N. Y.—A new industrial thermometer catalogue (No. 1125B), containing 24 pages of conveniently arranged listings of the complete line of TAG industrial thermometers, has just been published by the company. The catalogue has much pertinent information about the construction of these instruments with many illustrations showing clearly, the various forms and connections that fit every application. Specification tables and price lists are included in the edition.

### BOOKS

**Handbook of Chemistry** (Second Edition)—This book, compiled and edited by Norbert Adolph Lange, Ph. D., is a volume of over 1800 pages. It has a page size of 5⅝"x7¾"; and is bound attractively in a durable red cover with cover printing in gold. The material within the volume includes all of the data of the first edition, revised and brought up to date, together with a number of new tables. Among the tables in the first edition that have been enlarged or rewritten are: First Aid Measures for Accidents and Antidotes of Poisons; Atomic Weights and Numbers; The Elements; Changes in Atomic Weights from 1894 to 1937; Nomenclature of Organic Compounds; Single Electrode Potentials; Composition and E. M. F. of Voltaic Cells; Organic Reagents for Inorganic Analysis; Volumetric and Gravimetric Factors; Value of Gravity at Various Stations; and Probability Functions and Factors for Computing Probable Errors. Tables not in the previous edition include: Organic Ring Systems; Formula Index to Compounds Listed in Table of Physical Constants of Organic Compounds; Melting Points of Organic Compounds Arranged in Ascending Order of Melting Points; Refractive Index of Isotropic Solids, Uniaxial Positive and Negative Crystals, Biaxial Positive and Negative Crystals, Pure Liquids, Water and Aqueous Solutions of Halogen Acids, Aqueous Solutions of Alcohol, and Aqueous Solutions of Glycerol; Formulas and Properties of Denatured Alcohol; and Authorized Uses of Denatured Alcohol Formulas. A mathematical appendix of 250 pages and an index of more than 2700 entries complete the volume. The mathematical appendix, compiled by a mathematician, makes a very practical section for such a work, which, as a whole, is well arranged and easily usable. The book should make a valuable addition to the technical library of the pulp and paper mill chemist, technologist, or engineer. Published by Handbook Publishers, Inc., Sandusky, Ohio, it is priced at $6.00 a copy.

# The Paper Industry Safety Contest

**July 1, 1937 to June 30, 1938**

**Cumulative Scores as of November 30**

**22 Mills Have Perfect Record**

## PERFECT SCORES

### Division I—Paper and Pulp Mills

| | PARTICIPANT | MILL | LOCATION |
|---|---|---|---|
| A | Container Corp. of America | Philadelphia | Pennsylvania |
| B | | | |
| C | Strathmore Paper Company | Woronoco | Massachusetts |
| C | Finch Pruyn & Co., Inc. | Glens Falls | New York |
| D | The Harriman Company | Harriman | Tennessee |
| D | Container Corp. of America | Carthage | Indiana |
| D | Bird & Son, Inc. | Phillipsdale | Rhode Island |
| D | Union Bag & Paper Corp. | Allen Paper Mill | Hudson Falls, N. Y. |
| D | Crown Willamette Paper Co. | Lebanon | Oregon |
| D | Spaulding Fibre Co., Inc. | Milton | New Hampshire |
| D | United States Envelope Co | Morgan Paper Co. Div. | Lititz, Pa. |
| D | The Mead Corporation | Nashville | Tennessee |
| D | Rogers Fibre Co., Inc. | Bar Mills | Maine |
| D | Hollingsworth & Whitney Co. | Aroostook & Cobbossee Mills | Gardner, Maine |
| D | International Paper Co. | Riley No. 23 | Riley, Maine |
| D | Alton Box Board Co. | Carlyle | Illinois |
| D | Spaulding Fibre Co., Inc. | Hayes Plant | North Rochester, N. H. |

### Division II—Paper and Board Re-Manufacturing

| | | | |
|---|---|---|---|
| | Bird & Son, Inc. | Norwood | Massachusetts |
| | Bird & Son, Inc. | Chicago | Illinois |
| | Texas Corrugated Box Co., Inc. | Dallas | Texas |
| | Bemis Brothers Bag Co. | East Pepperell | Massachusetts |
| | Bay West Paper Co. | Green Bay | Wisconsin |
| | Fisher Paper Box Co. | Minneapolis | Minnesota |

## IMPERFECT SCORES

| | Key Number | Rank | Disabling Injuries | Frequency Rate |
|---|---|---|---|---|
| GROUP A | P-139 | 2 | 1 | 1.250 |
| | P- 13 | 3 | 2 | 2.554 |
| | P-108 | 4 | 4 | 3.412 |
| | P- 12 | 5 | 3 | 3.650 |
| | P- 19 | 6 | 3 | 5.213 |
| | P- 1 | 7 | 8 | 5.733 |
| | P-121 | 8 | 4 | 6.392 |
| | P- 84 | 9 | 6 | 7.029 |
| | P- 18 | 10 | 8 | 7.100 |
| | P-136 | 11 | 6 | 8.291 |
| | P- 30 | 12 | 5 | 8.381 |
| | P- 28 | 13 | 17 | 8.428 |
| | P- 69 | 14 | 7 | 8.830 |
| | P-102 | 15 | 7 | 9.047 |
| | P- 10 | 16 | 8 | 9.277 |
| | P- 21 | 17 | 7 | 9.644 |
| | P-128 | 18 | 4 | 9.857 |
| | P- 9 | 19 | 13 | 10.310 |
| | P-107 | 20 | 6 | 11.111 |
| | P- 27 | 21 | 29 | 12.147 |
| | P- 62 | 22 | 12 | 12.806 |
| | P- 11 | 23 | 10 | 13.693 |
| | P- 23 | 24 | 9 | 15.943 |
| | P- 2 | 25 | 9 | 17.181 |
| | P- 64 | 26 | 13 | 17.217 |
| | P- 73 | 27 | 26 | 20.353 |
| | P- 67 | 28 | 26 | 21.295 |
| | P-120 | 29 | 11 | 26.908 |
| | P- 40 | 30 | 23 | 27.431 |
| | P- 87 | 31 | 31 | 30.984 |
| | P-114 | 32 | 30 | 35.179 |
| | P- 32 | 33 | 25 | 37.093 |
| | P-140 | 34 | 30 | 42.113 |
| | P- 71 | 35 | 34 | 55.050 |
| GROUP B | P- 68 | 1 | 1 | 2.066 |
| | P- 4 | 2 | 1 | 2.770 |
| | P- 22 | 3 | 2 | 4.115 |
| | P-135 | 4 | 2 | 4.759 |
| | P-143 | 5 | 2 | 5.459 |
| | P- 72 | 6 | 2 | 5.483 |
| | P-133 | 7 | 3 | 6.529 |
| | P- 97 | 8 | 3 | 6.758 |
| | P- 59 | 9 | 3 | 7.424 |
| | P- 60 | 10 | 4 | 8.720 |
| | P- 58 | 11 | 4 | 8.924 |
| | P-122 | 12 | 4 | 9.022 |
| | P- 70 | 13 | 4 | 9.350 |
| | P-142 | 14 | 4 | 10.255 |
| | P-119 | 15 | 4 | 12.799 |
| | P-112 | 16 | 7 | 15.158 |
| | P-124 | 17 | 6 | 18.081 |
| | P- 45 | 18 | 7 | 18.458 |
| | P- 26 | 19 | 9 | 20.341 |
| | P- 16 | 20 | 8 | 20.853 |
| | P- 15 | 21 | 9 | 22.706 |
| | P- 25 | 22 | 11 | 23.340 |
| | P-123 | 23 | 10 | 23.904 |
| | P- 3 | 24 | 12 | 25.450 |
| | P-137 | 25 | 10 | 27.000 |
| | P-130 | 26 | 12 | 31.723 |
| | P- 82 | 27 | 14 | 35.444 |
| | P-104 | 28 | 16 | 44.437 |
| GROUP C | P- 55 | 3 | 1 | 3.452 |
| | P- 43 | 4 | 1 | 5.254 |
| | P- 37 | 5 | 2 | 10.365 |
| | P- 88 | 6 | 3 | 10.557 |
| | P-116 | 7 | 2 | 12.327 |
| | P- 52 | 8 | 3 | 12.655 |
| | P-113 | 9 | 3 | 15.161 |

| | Key Number | Rank | Disabling Injuries | Frequency Rate |
|---|---|---|---|---|
| GROUP C | P- 61 | 10 | 4 | 16.348 |
| | P- 46 | 11 | 6 | 20.087 |
| | P- 94 | 12 | 4 | 22.064 |
| | P- 14 | 13 | 4 | 24.876 |
| | P- 33 | 14 | 6 | 25.971 |
| | P- 29 | 15 | 5 | 26.291 |
| | P-103 | 16 | 5 | 30.211 |
| | P- 47 | 17 | 6 | 31.623 |
| | P- 17 | 18 | 6 | 33.932 |
| | P- 41 | 19 | 11 | 39.891 |
| | P- 34 | 20 | 8 | 45.747 |
| | P-111 | 21 | 10 | 47.438 |
| | P- 48 | 22 | 8 | 48.215 |
| | P- 80 | 23 | 14 | 76.068 |
| | P-144 | Withdrawn—Reports Missing. | | |
| GROUP D | P- 49 | 14 | 1 | 8.514 |
| | P- 42 | 15 | 1 | 10.670 |
| | P- 93 | 16 | 1 | 12.357 |
| | P-125 | 17 | 1 | 13.559 |
| | P-141 | 18 | 1 | 15.468 |
| | P- 91 | 19 | 2 | 15.563 |
| | P- 35 | 20 | 1 | 17.736 |
| | P- 6 | 21 | 3 | 22.685 |
| | P- 99 | 22 | 2 | 24.807 |
| | P-110 | 23 | 1 | 25.344 |
| | P-106 | 24 | 3 | 26.591 |
| | P- 63 | 25 | 4 | 33.681 |
| | P-134 | 26 | 4 | 33.882 |
| | P- 81 | 27 | 4 | 34.619 |
| | P-138 | 28 | 4 | 35.297 |
| | P- 36 | 29 | 3 | 36.157 |
| | P- 7 | 30 | 5 | 39.630 |
| | P- 65 | 31 | 3 | 41.535 |
| | P- 98 | 32 | 4 | 42.427 |
| | P- 38 | 33 | 3 | 54.535 |
| | P-131 | 34 | 5 | 81.788 |

### Division II—Paper and Board Re-Manufacturing

| | | | | |
|---|---|---|---|---|
| | R-20 | 7 | 1 | 2.232 |
| | R-23 | 8 | 1 | 2.494 |
| | R-19 | 9 | 1 | 6.302 |
| | R-13 | 10 | 1 | 7.261 |
| | R-21 | 11 | 3 | 10.180 |
| | R-27 | 12 | 2 | 12.710 |
| | R-28 | 13 | 3 | 12.736 |
| | R- 5 | 14 | 6 | 14.034 |
| | R-10 | 15 | 3 | 14.118 |
| | R-22 | 16 | 1 | 20.555 |
| | R-11 | 17 | 1 | 22.098 |
| | R-24 | 18 | 5 | 24.566 |
| | R- 9 | 19 | 4 | 35.214 |
| | R- 1 | 20 | 9 | 37.534 |
| | R-26 | 21 | 9 | 52.165 |
| | R- 4 | 22 | 2 | 52.357 |
| | R-18 | Withdrawn—Reports Missing. | | |

November Report Missing—covers five months only:

Crown Willamette Paper Co., Lebanon, Oregon; Alton Box Board Co., Carlyle, Ill.; Bay West Paper Co., Green Bay, Wis.; Fisher Paper Box Co., Minneapolis, Minn.; P-121; P-128; P-120; P-114; P-124; P-130; P-82; P-37; P-34; P-35; P-36; P-131; R-24.


# LEARN THE SECRET

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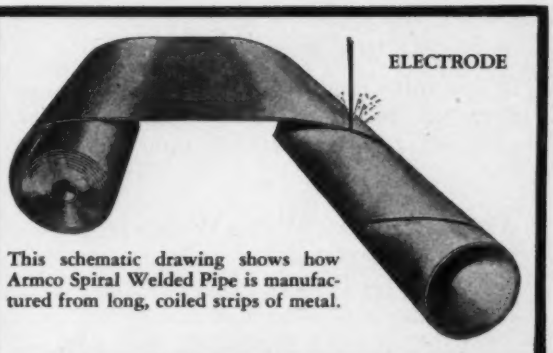
# REAL PIPE ECONOMY




This schematic drawing shows how Armco Spiral Welded Pipe is manufactured from long, coiled strips of metal.

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| 2—300 hp Wgse. 360 rpm | 1—750 hp El. Mch. 514 rpm | 1—800 K.W. Sync. Compl. |
| 1—200 hp G. E. 600 rpm | 1—315 hp G. E., 600 rpm | TURBO-GENERATORS. |
| 1—200 hp Burke 900 rpm | 1—150 hp G. E. 600 rpm | 1—1250 KW Condens. |
| 3—200 Al. Ch. 720 rpm | 1—100 hp G. E. 900 rpm | 2— 750 KW Condens. |

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# Chemical Exposition Reaches New High

THE American chemical industry, in terms of its Exposition, marked a new high-point of progress in 1937. The Sixteenth Exposition of Chemical Industries, held at Grand Central Palace, New York, December 6 to 11, has set a new standard for comprehensiveness, technical accuracy, and style. Every leading phase of American chemical industry was portrayed graphically. There were some 300 exhibitors who occupied three entire floors at Grand Central Palace. In the design of exhibit booths, in the presentation of products, and sometimes in the products themselves, the lavish and generally expert use of color marked a trend. Quick comprehension by audience was facilitated through condensed and dramatized messages and through the sequential or terraced arrangement of products with the newest advances out front.

The American Chemical Society's exhibit again struck a keynote when it called its industrial proteges, "The Children of Prosperity." This brought to mind the appellation of the same exhibit four years ago, "The Children of Depression" and of two years ago "The Children of Recovery". This year it was industrial success which was everywhere reflected by exhibits, more colorful, more comprehensive, more readily comprehensible, and interesting than ever before. The men who exhibited the materials and machines contributed stories from all sections of the exhibit floors, generally to the effect that the Sixteenth Exposition was outstanding, not only in value for those who attended, but in terms of sales for those who exhibited. The man power handling the exhibits was of high calibre. In the case of one steel company, the vice president in charge of research, and the associate director, were listed by name as available for consultation at the booth.

Chemical engineers and chemists who made up a large portion of the audience were augmented by hundreds of other engineering specialists connected with every form of technical industry who were in town for the purpose of attending the annual meeting of the American Society of Mechanical Engineers which was held during the same week. The New York Section of the American Chemical Society held a meeting of unusual interest on the Friday evening of Exposition Week and this was attended by many visitors from out-of-town.

The $250 cash award, first prize in the slogan contest to secure a brief and descriptive expression encompassing the aims, and suggesting the manifold benefits of, the chemical and chemical process industries, was presented on the evening of the opening day of the Exposition, December 6. The winner was Norman E. Diehl of E. I. duPont de Nemours & Company. Ten lesser prizes had been awarded by mail.

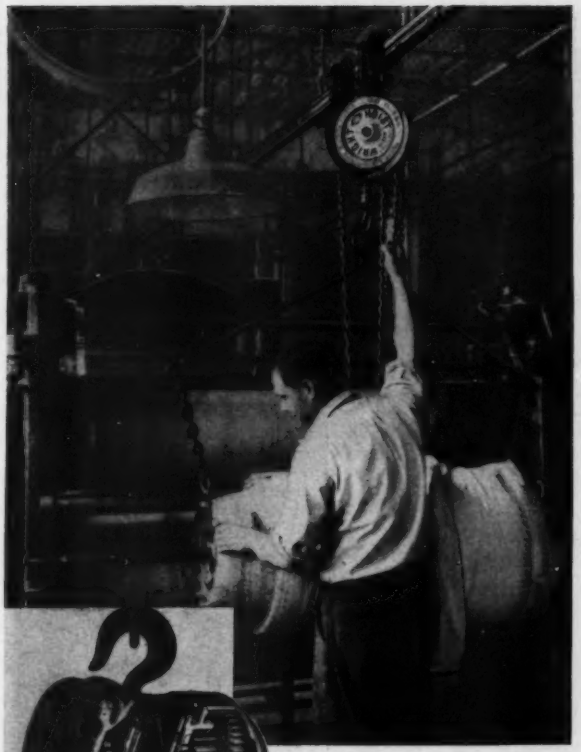
The student course in chemical engineering which has become an established feature of the Chemical Exposition was presented. Professor W. T. Read, Dean of Chemistry, Rutgers University, was again director of the course. Professor Harry J. Masson, Director of the Department of Chemical Engineering, New York University, served as chairman of the educational committee of the Chemical Exposition, under whose auspices the course is held.

The Advisory Committee of the Exposition comprised M. C. Whitaker, Chairman, Raymond F. Bacon, L. H. Baekeland, William Callan, J. V. N. Dorr, Henry B. Faber, William G. Harvey, William Haynes, Charles H. Herty, H. E. Howe, Martin H. Ittner, Sidney D. Kirkpatrick, Charles Lichtenberg, W. T. Read, H. J. Schnell, R. Gordon Walker, E. R. Weidlein, Harry J. Masson and Charles F. Roth, Manager of Exposition.

The Sixteenth Exposition of Chemical Industries was under the personal direction of Charles F. Roth who has directed each of these presentations since the first one was organized in 1915. Mr. Roth is president of the International Exposition Company.

### Chemicals and Chemical Products

Scores of new research achievements were presented, many in the organic field. These included emulsifying agents, synthetic waxes and resins, and a high-boiling, mild-odored plasticizing oil for resins. Other organic materials on display included glyceryl stearate, glyceryl laurate, hydroxylamine hydrochloride, hydroxylamine sulphate, benzanilide, para-hy-

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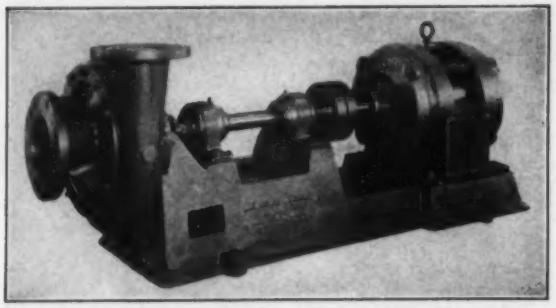

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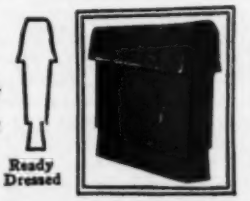


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droxy phenyl glycine, and phenylhydrazine hydrochloride.

A large manufacturer of explosives drew attention to research achievements in terms of a chlorinated rubber base designed to give longer life to paints, a low cost resin for use in varnishes and insulating compounds, various synthetic resins, a liquid resin resistant to water and alkali, and a liquid resin with plasticizing and adhesive characteristics. The raw material basis for some of these products is tree stumps of southern pines, and cotton linters. Both raw materials, before research developed them, were worthless industrially and were of no value to farmers. Synthetic resins on display were of many varieties including phenolic, cellulose acetate, coumarone-indene, and thermoplastic cyclo-paraffin.

Silicates, particularly those of sodium, were well represented, one exhibitor showing thirty-three different kinds. Also exhibited was a new modified silicate adhesive. Recently discovered in the process of manufacturing silicate-clay adhesives, it is said to be of unusual potential value to the corrugated board industry. Attention was called to applications of silicates in many industries including paper, soap, textile, chemical, ceramic, laundry, building, food, metal and petroleum.

Broadly indicated throughout the Exposition was the fact that American industry can produce chemical rarities which heretofore have been imported or have been made primarily as laboratory curiosities.

Refractories of many kinds were displayed including block and tile forms; also cements, and the tools for applying them. Thermal insulation drew especial attention, particularly the new fibrous glass which was demonstrated by operating exhibits to show such properties as lightness, "non-settling", and temperature resistance. For other applications, fibrous glass was defined in terms of sound absorption, acid resistance, and with reference to its uses as electrical insulation. The average glass fibre as produced is ten inches long and one-tenth the diameter of a human hair.

**Metals and Alloys**

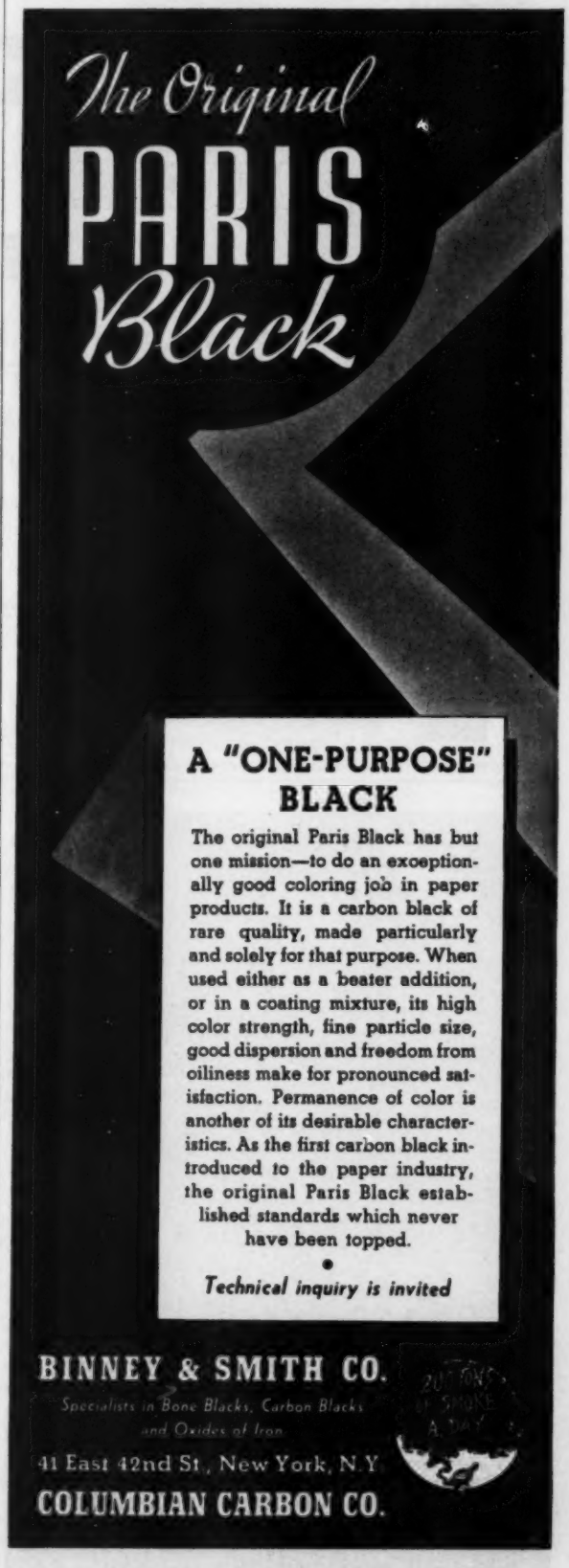
The role of metals and alloys in chemical engineering construction was demonstrated by comprehensive exhibits of steel and corrosion-resistant alloys, and of the non-ferrous metals such as aluminum, copper, brass, and bronze. The weldability of stainless steels was demonstrated. Other items in the metals section included special tubing for a variety of process applications, pressed steel tanks, woven wire fabrics, wire rope, cable. Couplings, and valves, in brass, aluminum alloy, steel, and nickel, and in all sizes, were shown for services involving a complete range of pressure and temperature conditions. Crucible-refined high-silicon iron was a featured metal for construction of acid handling equipment.

Displays of gold, silver, platinum, and rhodium, showed the newest applications of these metals for both laboratory and plant. Exhibitors of platinum laboratory ware drew attention to improved catalysts for large scale industrial processes. Rhodium-platinum alloys used in certain of the most difficult industrial processes were on display. Other items included silver-platinum bimetallic sheets, platinum-iridium electrical contacts, and fine silver inlay-overlay on steel, bronze, copper, and other base metals.

The practical use of titanium and zirconium in the chemical fields is relatively new, but one exhibit at the Exposition was devoted to their recent applications. Featured were the metals themselves, their salts, oxides, and silicates. Interesting applications included opacifying vitreous enamels, manufacture of welding rod fluxes, processing ceramic bodies, and for glaze work.

Tantalum was the subject of an educational exhibit depicting the mining, ores, intermediates, metallurgy, and fabricated products. Severe service corrosion problems were emphasized. Reference was made to the recent discovery of tantalum in the Black Hills of South Dakota. Until this year the world's tantalum supply had been mined in Australia.

Specialized applications of lead and its alloys included homogeneous lead-lined vacuum apparatus, evaporator tanks, steam-jacketed kettles, digesters, heating and cooling coils. The aim of corrosion resistant construction of the lead-lined type is to secure a combination of the acid resisting qualities of lead plus the strength of steel and copper. Related metal products on display included antimonial sheet lead, and tellurium sheet lead; also piping. Other items in the metals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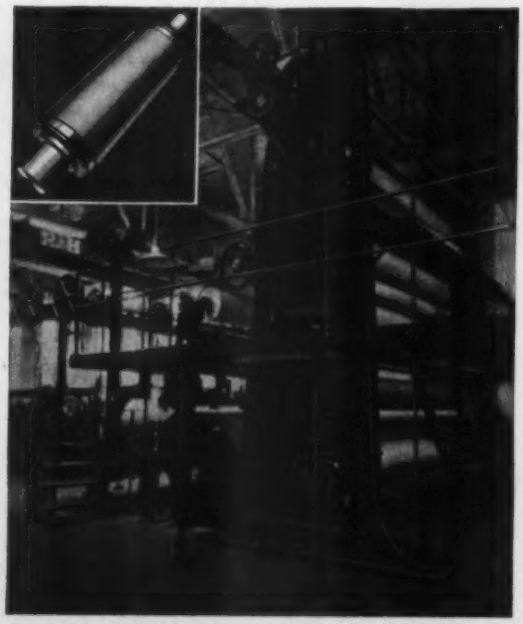

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**SOLVAY SALES CORPORATION**

*Alkalies and Chemical Products Manufactured by The Solvay Process Company*

**40 RECTOR STREET NEW YORK**

section included special products of tungsten and molybdenum, rubber-covered steel manifolds, Babbitt metals, casting metals, type metals, and solder; also pewter and block tin in sheets, impression lead, gasket metal, and discs for making collapsible tubes.

**Machinery**

Machinery and equipment for the industrial handling of all of the unit processes of chemical engineering was shown at this Exposition. These processes include industrial stoichiometry, flow of fluids, flow of heat, handling of fuels and production of power; combustion, crushing and grinding, mechanical separation, filtration, vaporization, evaporation, humidification, drying and distillation.

Twelve exhibitors offered machinery for the paper making industry, twelve for the pharmaceutical industry, fifteen for rayon, and twenty-one for the food industry. Seventeen manufacturers showed distilling machinery and apparatus. Drying machinery and equipment was featured by some twenty-six firms.

Crushing and grinding machinery, designed to reduce various chemical products to varying degrees of particle size included crushers, grinders, sifters, vibratory screens, classifiers, separators, and ball and pebble mills.

The separation of solids from liquids and the related problems of clarification and sterilization were well represented. In addition to the customary fabric and woven wire media, filter cloth woven of glass was on display. A new automatic self-cleaning filter operated by hydraulic mechanism was shown for the first time. An hydraulic closer for filter presses emphasized safety, and economies in time, labor, cloths, and frames.

Centrifugals, extractors, generally featured the conversion from batch to continuous operation. Centrifugal filtering now takes its place with other continuous flow operations. The mechanical achievement means enormous increases in efficiency and economy in many process industries. Batch centrifugals featured new methods of reducing spindle and basket speed to extremely low revolutions per minute, making them better adapted to unloading operation. Bronze, steel, and aluminum were materials chosen for basket construction.

Dryers on display included "super dryers with oscillating type feed," rotary test ovens, revolving cylindrical dryers, and rotary steam dryers. Stainless steel and corrosion resistant construction generally was featured.

A total of thirty-three exhibitors showed pumps of all kinds for all services. A line of acid-proof pumps and exhausters featured chemical stoneware as the material of construction. Stainless steels, resistant to weak sulphuric acid, and high-silicon iron, resistant to hydrochloric acid, were among the other types of construction. An innovation at the Exposition this year were pumps and valves made entirely of glass.

Valves and fittings represented every possible combination of metals including iron, steel, bronze, aluminum, monel, nickel, and chrome.

Tanks and pipe lines made of molded, phenolic resin, asbestos composition were featured in terms of applications requiring resistance to corrosive agents. Glass as a material for pipe lines was portrayed at the Exposition in terms of its latest development—namely, larger diameters.

Materials handling equipment included hydraulic lifts, stackers, racks, and skids, also conveyors of varied types. One telescoping portable lifter with capacity of 750 pounds operates from an ordinary lamp socket. It is adapted to handling barrels, drums, carboys, cylinders, and heavy rolls of paper. Another electrically operated portable elevator has a revolving base.

**Containers and Packaging**

Containers on display included bags, bottles, jars, boxes, cans, kegs, barrels, and drums. Equipment for filling, labelling and handling each form of container was shown. One exhibitor featured an automatic multi-wall, paper valve-bag packing machine. Multi-wall bags of moisture proof construction were recommended for packing hygroscopic and deliquescent materials. While the valve type of bag has been restricted hitherto to pulverized materials, the new packer makes it adaptable to granular and crystalline forms. Paper-lined textile bags with all-directional stretch were demonstrated for handling a variety of chemical products.

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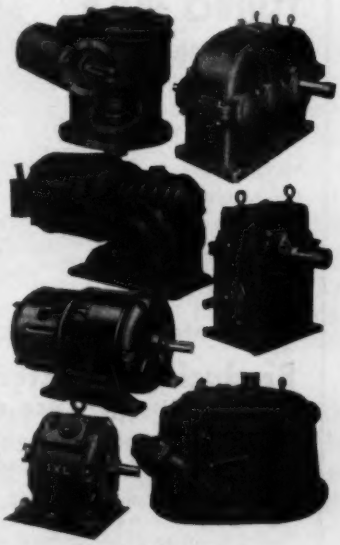

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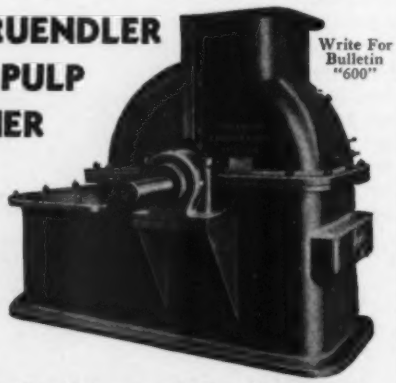

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**50%**

Separates, Hydrates, and Combs Fibres

**Producing a Better Refined Pulp at *Less Cost***

The remarkable GRUENDLER REFINER not only does the work with less power than other refiners, but it actually separates, hydrates and combs the fibres without disintegration and shortening of fibre usually caused by grinding. Laboratory tests prove that the pulp refined produces stronger paper than that refined by conventional refiners.

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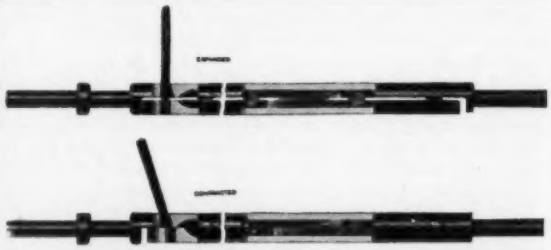

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Write for descriptive folder on any Murray Paper Mill, Pulp Mill, or Wood Room Equipment in which you are interested.

Shown here in both expanded and contracted positions, Murray Collapsible Winder Shafts are easily inserted or removed from the rolls—no sticking or breaking of shafts. Designed to operate freely, they are accurately machined for smoothness and ease of operation . . . will stand abuse and give maximum service . . . made to individual paper machine specifications, to meet individual conditions and in all diameters for any size and width of roll desired. Send us your specifications for quotations.

**D. J. Murray Mfg. Co.**

WAUSAU ~ WISCONSIN.

Band steel strapping was exhibited for use with the heavier packages and shipping containers, also stapling wire in colors for stitching fibre and corrugated containers. Special containers included cylinders for gases such as chlorine, ammonia, sulphur dioxide, methyl chloride, freon and acetylene.

**Instruments and Laboratory Equipment**

Twenty-eight exhibitors showed instruments of precision. Generally, these serve to indicate, record, or control such physical factors as temperature, pressure, humidity, coloration, turbidity, liquid level, acidity, alkalinity, and hydrogen-ion concentration. One advance which the Chemical Exposition demonstrated was the new system of co-ordinated control. The working of this system results in the completely automatic control and coordination of a variety of instruments governing several distinct fields of measurement.

Precision instruments at the Exposition included microscopes polariscopes, electric flow meters and electric integrators, potentiometer pyrometer controllers, air-operated temperature controllers; electrically operated, enclosed mercury-switch pressure controllers; wide-strip recording resistance thermometers, hydrometers, wall-type indicating pyrometers, resistance thermometers, direct reading air velocity meters, industrial thermometers, oil testing instruments, chemical thermometers and hydrometers. Other items included automatic controls for water, oil, or air baths, also a new portable test unit for the measurement of dust loading in moving gas streams, particularly cinder and fly-ash concentration in furnaces, boilers, breechings or stacks.

Other items of laboratory equipment on display included balances of many types, galvanometers, photo-electric instruments, and a new instrument for potentiometric, conductometric, and dielectric constant analysis. A new ultra-centrifuge was demonstrated which operated at a speed of 80,000 r.p.m., developing 250,000 times the force of gravity in a vacuum of two-tenths of a micron pressure. Special photographic equipment was used to take pictures of the action inside the bowl while running.

Drying equipment for the laboratory included a new gas-fired oven said to give interior uniformity tests within one degree Centigrade and temperature control within less than one degree Centigrade, over the entire operating range from 125 to 500 Fahrenheit. The same exhibitor offered electric ovens with analogous operating characteristics.

Innovations in laboratory filtering included a new extremely low-ash filter paper that can be washed repeatedly without pulping; can be removed from the funnel and replaced without danger of tearing. A full range of laboratory glassware for chemical, physical, biological, and metallurgical research was shown. Features included low expansion under heat, easy readability, precision markings. A new type Liebig condenser was offered. Also newly introduced at the Exposition was a new glass exhauster for corrosive gases or liquids, also a new rapid, accurate method for the definite detection of incomplete pasteurization of milk and cream. An electrical manufacturer featured sodium and mercury arcs for laboratory use. Hydrogen-ion apparatus was shown by a total of ten exhibitors. Improved types of glass electrodes for pH determinations were shown.

During recent decades the design of laboratory furniture and apparatus has made many advances. This applies to the desks, hoods, reagent cabinets, stock room shelving, and other accessories of the educational and industrial laboratory. Features noted were painted pipe lines, chromium fittings, white sinks, attractive woodwork, sturdy metal construction.

**Dust Collectors**

Dust collecting systems were exhibited at the Exposition by ten companies. Many processing machine units have dust eliminating features. Gas cleaning and dust collecting equipment was represented by operating exhibits. In one of these, the operating model of a precipitator, glass-enclosed for demonstration, spectators could see the method by which an electrical discharge instantly precipitates a deposit of smoke and clears the atmosphere. Collection of the finest kinds of dust and bacteria was claimed and remarkable savings were indicated in the handling of costly materials especially in the ceramic and chemical fields.

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- Standing between your needs for dryer felts and the vast cotton fields of the South, is this great unit of Mt. Vernon-Woodberry Mills.
- Endowed with all that nature can bestow upon it . . . fine water . . . proximity to raw materials . . . a temperate balanced climate . . . a degree of uniformity in product becomes attainable here that less favorable conditions could not make possible. Operating within these walls the most modern mill equipment man has yet conceived, skilled workers are guided by more than half a century's experience which Mt. Vernon-Woodberry Mills build into every fabric that bears their name.
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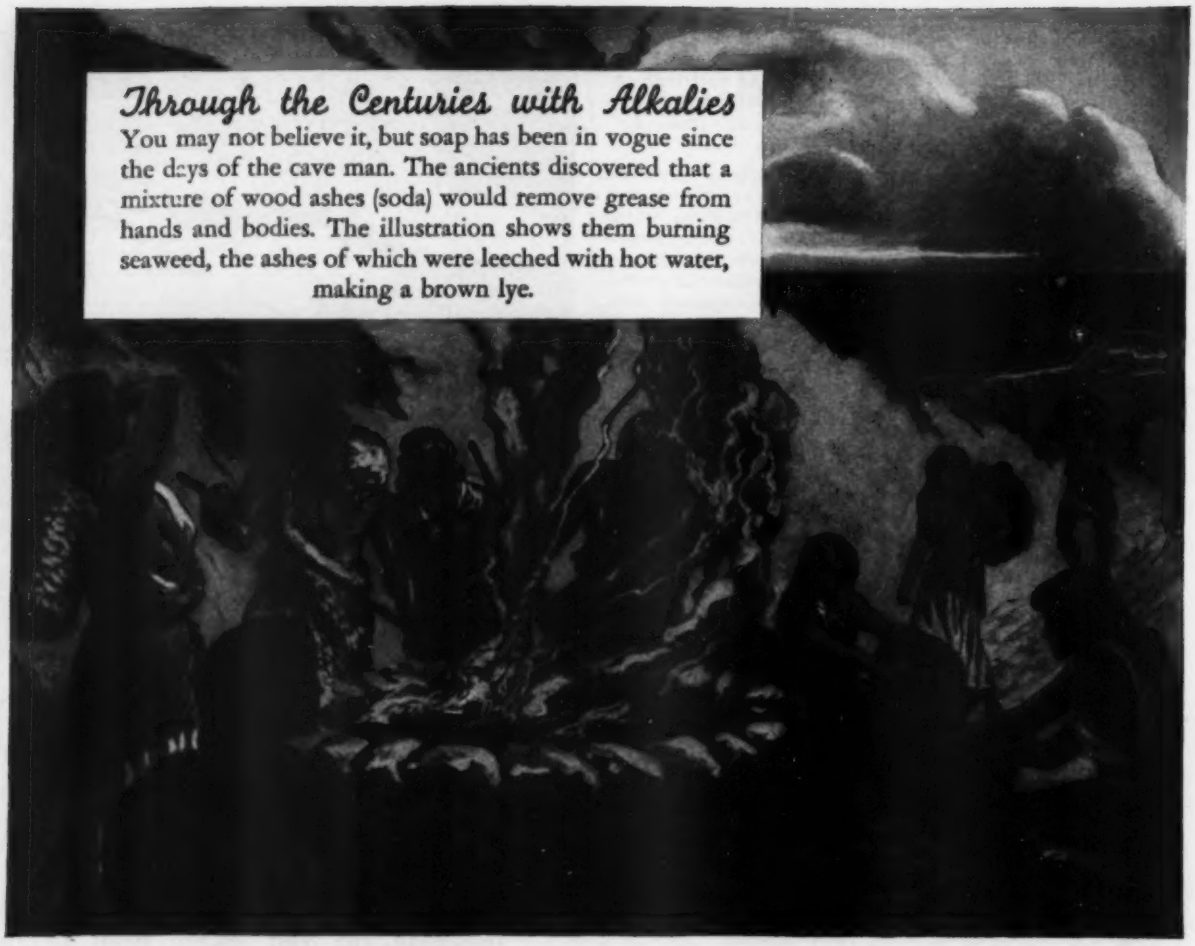
Through the Centuries with Alkalies
You may not believe it, but soap has been in vogue since the days of the cave man. The ancients discovered that a mixture of wood ashes (soda) would remove grease from hands and bodies. The illustration shows them burning seaweed, the ashes of which were leeched with hot water, making a brown lye.

**Users of COLUMBIA Soda Ash, Caustic Soda, and other products know that here are man-made products which are the finest obtainable. To others, may we suggest that you lose no time in discovering for yourself the extreme uniformity, . . . the freedom from variability . . . and from impurities . . . that characterizes all COLUMBIA ALKALI CORPORATION products. And COLUMBIA Service has been found just as dependable as the alkalies which bear its name.**

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**CAUSTIC SODA**
**SODIUM BICARBONATE**
**MODIFIED SODAS**
**LIQUID CHLORINE**
**CALCIUM CHLORIDE**

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**Scales**

Accurate weighing in industry was depicted by numerous displays. A new totalizing scale is designed to weigh automatically and indicate the amount of materials transported over belt conveyors. The totalizing unit may be located at any point remote from the operation.

**Electrical Equipment**

Electric motors adapted to the many specialized industries were exhibited. In addition to the usual open models, other types featured explosion-proof, dust-proof, and splash-proof construction. Line-starters were offered to meet demands for a reliable starter and disconnect switch of sufficient rupturing capacity for short circuit protection. Such starters are mounted in unit enclosures under oil. A new photo-electric spectro-photometer was exhibited. This is a device used to measure the spectral reflectance of a variety of materials. In the same booth, was shown an electrically operated thickness gauge for measuring thickness of paint on metal.


**ARTHUR B. GREEN**

*Member A.S.M.E., E.S.N.E., T.A.P.P.I., H.E.S.*

284 Harris Avenue, Needham, Massachusetts

Consulting in Methods of Manufacture, Paper and Paperboard

Exclusive System of Preparing Stock for the Machine

*Tempering the Air* WITH SPRINGTIME

There must be plenty of water for air conditioning, and wherever you find modern air conditioning units, you usually find Layne Pumps and Deep Well Water Systems. Many years of low upkeep, trouble-free service and lowest water costs are assured by a Layne installation.

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WELL WATER SYSTEMS

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*IMMEDIATE STEEL FOR MAINTENANCE AND REPAIR*

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Bars, Shapes, Structurals, Rails, Plates, Sheets—Steel, Copper, Alloy and Armco Ingot Iron—Plain, Galv. and Corrugated
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Boiler Fittings, Concrete Reinforcing, Welding Rods, Solder, Refined Iron, Stainless Steel
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*—CLEANER —LAST LONGER*

They are water lubricated • Consume less power • Help produce cleaner stock • Quickly replaced • Will run submerged in pulp stock • Last longer • Practically unaffected by acid solution. *Write for Bulletin 42*

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HIGH POROSITY

. . . as a characteristic of a paper maker's felt will, not only add to the life of felt, but saves time lost on the machine due to excessive shut downs for washing. Specify

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and minimize this trouble. Made by the Knox Woolen Co., of Camden, Maine, since 1864.

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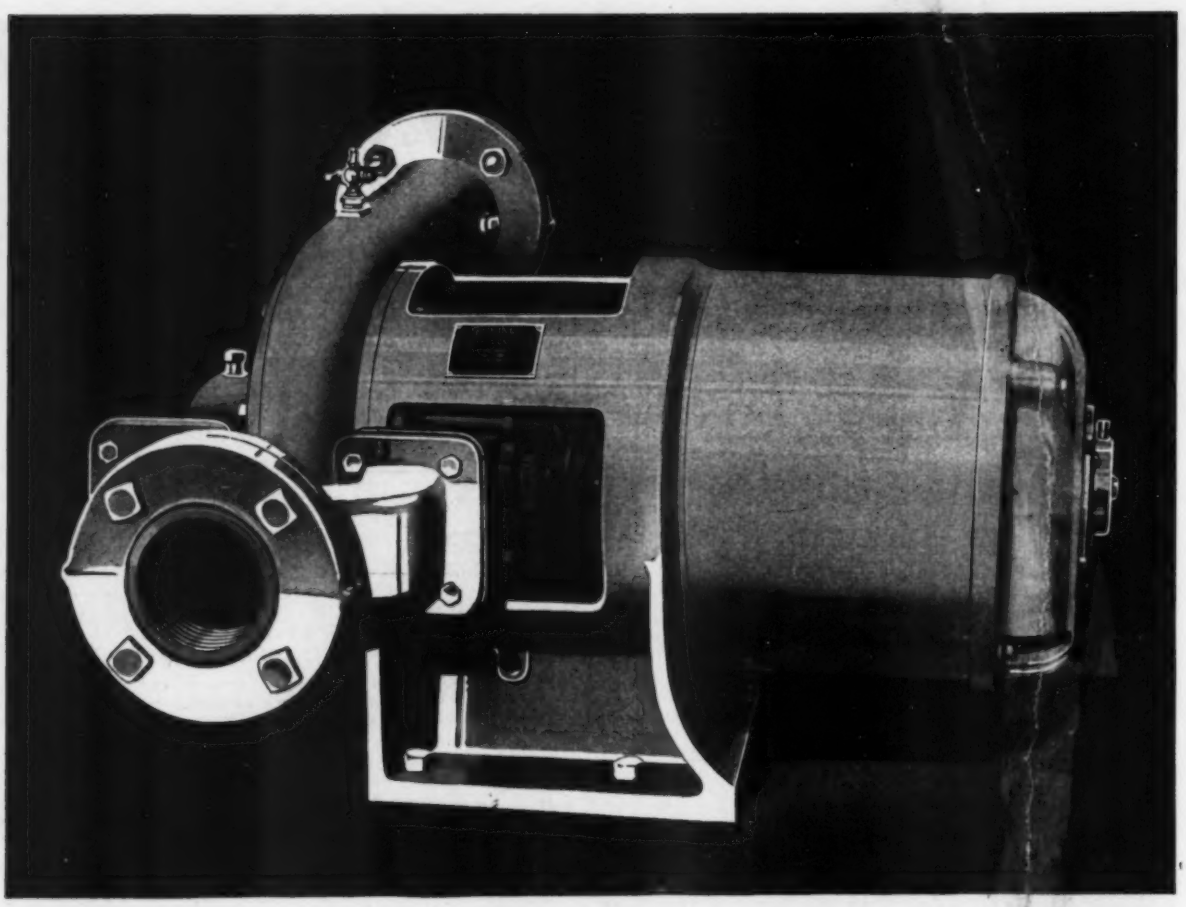

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Manufactured in a variety of designs to meet individual plant needs. Furnished in standard and self priming types. Standard close coupled type shown above is very compact and may be installed anywhere. Suction and discharge assembled in any desired position. Impeller designs engineered for high efficiency, and in variety to meet any type of service. Also in unit assembly with Nash Vacuum Pumps for combinations of liquid and air. Bulletin 236 tells the story. Your copy is waiting.

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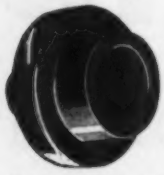
SOUTH NORWALK, CONNECTICUT, U. S. A.

Non-Clog type impeller for solids up to ½ inch.



If solids run up to ⅞ in. this will do the job.

An impeller for heavy sewage with solids up to 2⅜ inches.

Efficient closed impeller for clear liquids.

A closed impeller for Double Suction Pumps.

This Air Rotor makes our Suction Centrifugals self priming.

# POWER

## GENERATION + UTILIZATION + MAINTENANCE

**This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worthwhile practices suggest new ideas and wider usages of equipment.**

By W. S. JOULE

### ◆ Thickness of Fuel Bed

The thickness of the fuel bed in hand firing depends to a large extent upon the kind and quality of the coal used and the available draft. For a given operating condition and boiler setting the thickness giving the maximum efficiency is best determined by test. If too heavy a fuel bed is carried, the air supply will be insufficient for proper combustion. If the fuel bed is too thin, excess air will result. In either case the boiler efficiency will be decreased. It is considered the best practice to use as thin a bed as is consistent with the size of coal and the draft used. With the finer anthracites (rice and barley) a bed of 2 to 3 inches will give good results while with the coarse grade a 6- to 8-inch bed will be best. For bituminous coal the thickness of the fuel should be around 6 to 8 in. In general it may be said that the thickness of bed for any coal must be regulated according to the draft available and the load carried. The volatile content in the fuel also has an influence on the required thickness of fuel bed. The rate of flow of air through a bed of constant thickness is proportional to the square root of the pressure drop, and to put the same amount of air through double the thickness of bed requires twice the difference in pressure.

### ◆ Keeping the Boiler in Shape

Due to the forcing of boilers at extremely high ratings and the use of poor grades of coal, particularly those with ash of a low fusing point, the problem of boiler maintenance has become one of serious importance, in recent years. Fortunately, however, changes in methods of maintenance and the development of materials suited for the conditions, have aided in solving this operating problem.

Maintaining the furnace side walls, the bridge wall, arches, baffles and, in the case of horizontal return-tubular boilers, the back arch, in good condition so that a boiler can be kept in operation for as long a period as possible without a complete overhauling, requires considerable study of both methods and materials. It is not possible, however, to make any definite statement as to the length of time between such periodic overhaulings since the general type of construction, the rating of the boiler and the coal which is used vary so much as to make each problem almost an individual case.

Most companies, however, are operating boilers from 3 to 6 months before it becomes necessary to make a complete repair job on the furnace. Sometimes it is necessary to make a temporary repair with a boiler in a banked condition, in order to carry the load until such time as it is possible to remove the unit from service. In any case, it is necessary to watch the condition of the furnace, including baffles, arches, side walls and bridge walls, so that they will not get in such bad shape as to require complete rebuilding or such extensive repairs as to make the maintenance cost excessive.

◆ HEATERS, LIKE ALL OTHER APPARATUS in a boiler plant, should be overhauled periodically. Particular attention should be given to the presence of oil and scale, to the tightness of joints and strength of parts. Owing to the low pressures carried in open heaters, it is usually unnecessary to make any particular tests for strength. In the case of closed heaters, an hydraulic test for strength is probably the most serviceable with such inspection of riveted joints and tubes as would ordinarily be given to a condenser or a boiler. In connection with the periodical overhauling, the heater should be carefully leveled so that the flow of water will be uniformly distributed.

### ◆ Care of Brushes

Brushes should be inspected to see that they move freely in the holders yet make firm, even contact with the commutator. The brush tension should be checked regularly to make sure that the proper tension (1¾ to 3 lb. per sq in.) is maintained by the springs.

When replacing brushes, they should be brought to a bearing by fitting fine sand paper around the commutator and revolving the rotor by hand in the running direction until a proper fit is obtained. On some machines, the sand paper can be held in place by cutting it to a width slightly narrower than the commutator, and inserting the front end of the strip into one of the narrow slots between commutator bars (where the mica has been undercut), then folding back around the commutator by slowly revolving the armature by hand until the paper moves under a set of brushes.

An operator should never shift the position of the brushes unless he knows positively that the brush position is incorrect or it is desired to change the direction of rotation or mounting of the machine. On machines with commutating poles, the position of the brushes is fixed on the neutral point at the factory and the position of the brushes on such machines should never be shifted, except to make change as indicated in the previous sentence, or for compounding or parallel operation of generators.

Care should be taken to see that the pigtails or flexible copper conductors are firmly fastened in place so that they will carry their full current from the brushes to the brush holders. A slight extra length should be left in the pigtails because, if they are too tight, they may tend to pull the brush out of line and out of proper contact with the surface of the commutator.

### ◆ Load Shocks on Motors

Due to its peculiar inherent characteristics, the induction motor is a machine having a relative small air gap, that is the clearance between the rotor iron and the stator iron is small compared to that of other types of rotating electrical machinery. The greater the air gap is made, the lower the power factor becomes, so that the clearances are made, from electrical considerations such that the power factor remains high, yet from mechanical standpoint to give absolutely reliable operation. The clearance is usually measured in thousandths of an inch, hence it is most important that the proper tolerances in the bearings be maintained and the rotor be kept central with respect to the center at all times.

For the above reasons any load action which has a tendency to injure the bearings should be given special consideration. For instance, the use of gear pinions mounted directly on the motor shaft on the larger size of motors, say 100 hp. and above, is not only likely to affect the bearings tolerances but the severe and continual mechanical vibration of the rotor and of the gears themselves will, in time, tend to crystallize soldered joints, cut through installation and loosen laminations. A flexible coupling between the motor and the gear unit has been found to overcome the troubles otherwise likely to occur.

◆ IT IS WISE TO ACQUIRE a correct knowledge of the peculiarities and the sounds of a machine when running. Any change in the nature of the sound will then attract the attention of the engineer. A good plan is to listen to the sounds inside the casing by gripping a pencil or small rod of steel between the teeth, stopping up the ears with the fingers and then placing the point on the casing, when a highly magnified sound will be heard.

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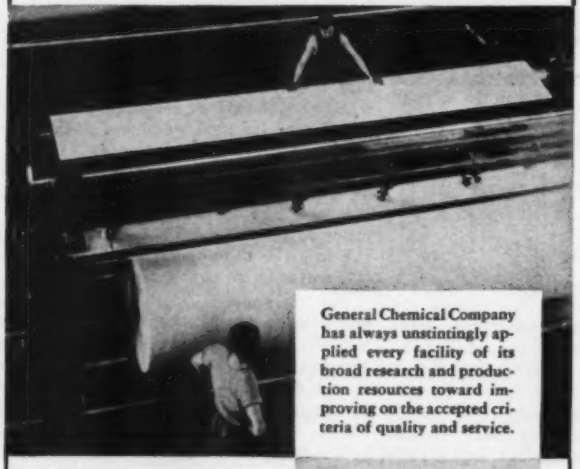

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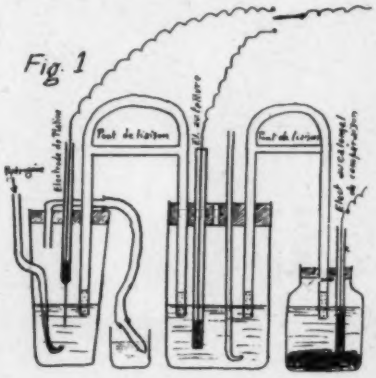
# TECHNICAL DEVELOPMENTS

**The following abstracts are of the latest developments found in the foreign press.**

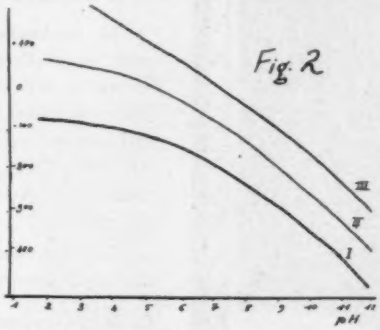
## IN THE PAPER INDUSTRY

### ◆ The Tellurium Electrode for pH Measurements

In 1934, Tomicek and Feldman (Coll. trav. chim. Tcheco-Slovaquie, Vol. 6, 408) showed that the tellurium electrode, first studied by Kasarnowsky, could be applied to pH determinations. Tomicek and Poupé elaborated on these findings in 1936 (Ibid. Vol. 8, 520). The present abstract outlines the work of these authors. Figure 1 shows a set-up in which the tellurium electrode in the center may be compared directly with the hydrogen electrode at the extreme left. At the extreme right is a comparator calomel electrode (elect. au calomel de comparaison) connected with the central tellurium electrode by means of a KCl bridge (pont de liaison). The tellurium electrode consists of a small rod of the element (7-9 mm. diameter) connected with a platinum wire, and is obtained by melting small amounts of tellurium in a glass tube having the right inner diameter. The surface of the tellurium must be cleaned very thoroughly, and traces of silver, copper, lead, or nickel must be absent. The tellurium electrode is connected in the circuit by copper wires fixed by Wood's alloy. The cell provides for the introduction of air (free from $CO_2$) or oxygen at the rate of 6-8 bubbles per second, since the electrode (after studying the effect of various gases) seems to function best under these conditions. Direct comparison with "classical" electrodes, shows that tellurium gives the same pre-




cision, and has certain marked advantages. For example, in solutions that contain tartrates the tellurium electrode functions better than does the antimony electrode. The theoretical equations follow those given by Nernst. In acid medium, the following equilibrium exists: $H_2TeO_3 + 4H^+ \rightleftarrows Te^{++++} + 3H_2O$. In alkaline media (above pH 9, where only $TeO_3$ -- ions exist) the equilibrium is $TeO_3$ -- $+ 6H^+ \rightleftarrows Te^{++++} + 3H_2O$. Calculations for arriving at the pH are given in detail. In Figure 2, graph I shows the pH as a function of the Te electrode potentials. In the same figure, curve II shows the marked effect




of traces of copper and silver; while curve III shows the disastrous effect of lead and nickel, in the tellurium. The electrode serves perfectly well in oxidizing solutions, and the author suggests its possible use in the paper industry. M. Déribéré. La Papeterie 59, No 19, 905-5 (1937).

### ◆ Phenol Derivatives in Pulping with Nitric Acid

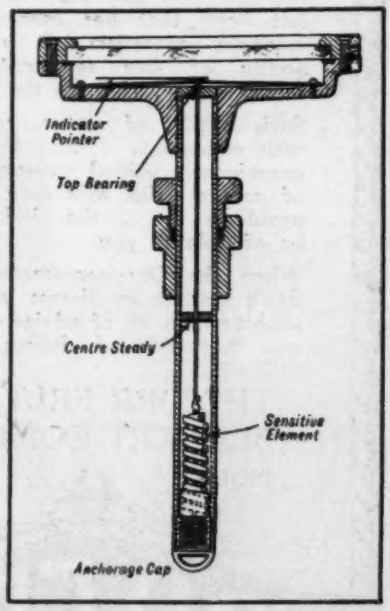
Bagasse when treated with nitric acid yielded, in the liquors, a yellow mixture consisting largely of 3-nitro-4-hydroxybenzaldehyde. Besides this smaller amounts of 3, 5-dinitro-4-hydroxybenzaldehyde and 3-nitro-4-hydroxybenzoic acid were also present. These substances were definitely identified, and the same phenolic bodies were formed when rice and wheat straws, bamboo, and wood were delignified by means of nitric acid. Quite evidently they are closely related to and derived from the lignin. By condensing one molecule of the 3-nitro-4-hydroxybenzaldehyde with two mols of dimethylaniline, a dyestuff related to malachite green was obtained. This dyes wool and silk a purplish red and dyes mordanted cotton a bluish green. Y. Hachihama and M. Onishi. J. Soc. Chem. Ind. of Japan, 39,262-3 (1936) through Papierfabr. 35 (Abstracts) 121 (1937).

### ◆ Cellulose Nitrate in the Paper Industry

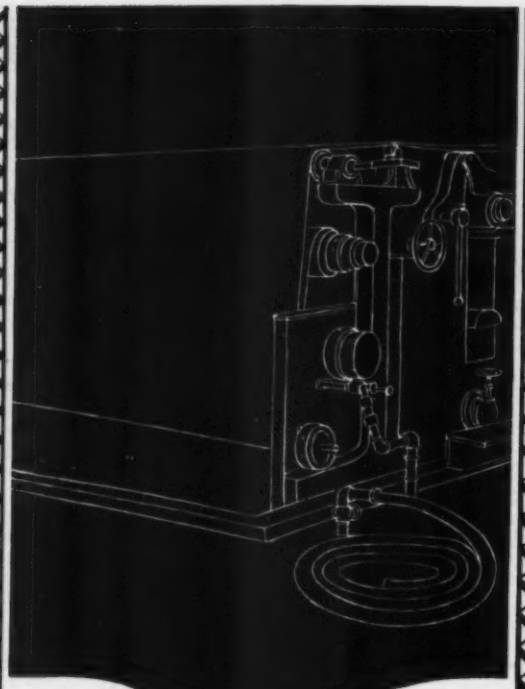
A brief review is given of the use of cellulose lacquers in the production of pyroxylin-coated papers and waterproof viscose films. With cheap, very porous papers, pretreatment with starch, gelatine, or methylcellulose is required prior to nitrocellulose coating. Through U. S. Patent No. 251,410 (et al.) this necessity has been overcome by the use of homogenized and emulsified lacquers. The advantages of coated papers in resisting dirt, oil fat, and water is discussed. So is the production of tracing paper by immersion in cellulose nitrate solutions, and of rendering wall-paper waterproof. The formation of permanent stencil paper, in which rice paper is the basis of the sheet and softening agents are added together with the cellulose nitrate, and the use of collodian in the coating of pasteboard boxes, and in causing the adhesion of pigments are briefly discussed. The use of ethyl alcohol-soluble nitrates for both high and medium viscosity lacquers is advised to prevent occupational diseases. A. Kraus. Papier-Fabr. (Tech. Teil) 35,373-5 (1937).

### ◆ New Thermometer

The figure shows a section of the instrument which has a sensitive bimetallic element with a thermal reaction independent of that of tubular steel stem. This element is a nickel-steel triple helix (attached to a cap at the end of the stem) the upper free end of which moves an indicator pointer. The dial, which is large and easily read, has a marked advantage over mercury thermometers in industrial use. The thermom-




eter has a low heat capacity that permits quick readings. Temperature range readings up to 1000 deg. F. may be made. "Engineer" Paper-Maker and Brit. Paper Trade J. 94 (T. S.) 179 (December 1937).



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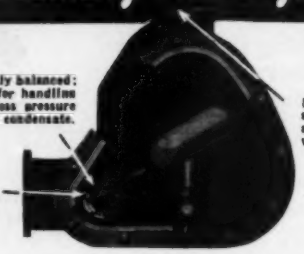
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### ◆ Various Lignin Studies

Dr. Friese and his co-workers have been engaged in a laborious series of fundamental studies on lignin, and this abstract gives a resumé of the 7th, 8th, and 9th communications from their laboratory. In the 7th paper, attempts were made to esterify the hydroxyl groups in coniferous (pine) wood by means of nitric acid in the hope of avoiding wood degradation, and of preserving the wood structure. However, when finely divided wood was subjected to nitration with the usual sulphuric and nitric acid mixtures, degradation could not be avoided, and a very appreciable amount of the wood entered solution. The yellow residue, which represented 55 per cent of the original wood, contained 8.45 per cent total nitrogen, 7.1 per cent ester nitrogen, and no methoxyl groups. The difference (1.35 per cent) was considered nitro-nitrogen, and is ascribed to the residual lignin, the methoxyl groups of which were removed by hydrolysis. When, in place of the sulphuric acid, a mixture of glacial acetic and phosphoric acids was used in the nitration described above, the yellow product weighed 5 per cent more than did the original wood. It contained 2.64 per cent ester nitrogen, 4.5 per cent total nitrogen, and 3 per cent methoxyl, the latter being approximately that found in the wood prior to nitration.

The authors describe various other combinations used in place of sulphuric acid during the nitration, but details of these orientating experiments require no review. The best results were probably obtained when the wood-flour was treated with an admixture of acetic anhydride, glacial acetic acid, and 100 per cent (?) nitric (d.l. 52 ?), at room temperature. The wood structure remained largely unaffected, and 100 grams of wood gave 165 grams of a yellow product containing 10.2 per cent ester nitrogen, 12.5 per cent total nitrogen, and a methoxyl content corresponding to that of the original wood. The hydroxyl groups of the polysaccahreides were thus esterified with the simultaneous nitration of lignin. The latter takes place more rapidly than does the nitration of the carbohydrate portion of the wood, since 2.5 per cent (i.e. the complete) nitro-formation had resulted before esterification (nitrate formation) was still incomplete.

The entire nitrated wood has been termed nitrowood. It bursts into flame at 175 deg. C., and is a reasonably stable product, although under certain conditions it gives off oxides of nitrogen. When nitrowood is extracted with acetone, the extract yields 6 per cent of a yellow material, but the residue becomes greatly swollen and exceedingly hard on removal of liquid and drying. This powdered dry residue swells again in certain organic solvents, in which the mass may become nearly transparent. Lignin isolated from wood by means of acid (termed Tornesch lignin) when nitrated under conditions identical with those leading to nitrowood, gives a product much more soluble in acetone and methanol than nitrowood. In fact nitrowood is prac-


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tically insoluble in the latter. It is interesting that the solvents that serve to separate individual wood components that have been individually methylated, acetylated or nitrated, will not serve to fractionate wood as a whole after it has been methylated, acetylated or nitrated.

Experiments were also carried out with pyridine and nitrowood, about 90 per cent of which dissolved with the saponification of the nitrate (ester) groups. Complete solution was effected with 25 per cent ammonia, or better yet, with Normal sodium methylate in methanol. The latter mixture acting at about 40 deg. C. converted nitrowood completely into water-soluble products within a few hours. The nitrowood, however, does not dissolve completely in the sodium methylate solution. About 50 per cent remains as a residue maintaining its original structure. However, the residue was water soluble. It contained practically no nitro-nitrogen, about 12.6 per cent Na, and 9 per cent methoxyl. When made up as a 5 per cent aqueous solution, and filtered through an ultrafilter having pores less than 10 millimicrons in diameter, about one-third of the material was filtered out. This brown powder contained 44.25 per cent carbon, 4.5 per cent hydrogen, 4.4 per cent nitrogen, 10.3 per cent methoxyl, and 3.4 per cent sodium (present as an alcoholate or phenolate). The sodium could be removed by $CO_2$ and the residue then contained 46.9 per cent carbon, 4.46 per cent hydrogen, 4.5 per cent nitrogen and 11.3 per cent methoxyl. This product could be acetylated, and represented about 22 per cent of the original wood.

The homogeneity of this nitro-product is in doubt. When the ultrafiltrate therefrom was filtered through the finest ultrafilter (one which filtered Congo Red out of solution) another fraction was obtained which on analysis gave 33 per cent carbon, 3.31 per cent hydrogen, 1.8 per cent total nitrogen, 0.4 per cent ester nitrogen, 5.1 per cent methoxyl, and 14.3 per cent sodium. The hydrolysis of this indicated that it was a lignin-carbohydrate complex. When the final filtrate was evaporated, it was shown to be free from methoxyl, and the nitrogen therein was shown to be due entirely to small amounts of sodium nitrate. Evidently a sugar was also at hand. Returning to the original solution of the nitrowood in sodium-methylate-methanol solution; when this was neutralized, only inorganic material separated. The filtrate from this was also largely inorganic (sodium nitrate), although small amounts of organic matter were present. This was investigated but is of no marked interest.

In the 8th paper of the series, the isolation and sulphonation of beechwood lignin are outlined. In previous investigations Friese had treated rye and spruce wood with sulphuric acid-acetic anhydride —glacial acetic acid mixtures. This same technique was now extended to red beechwood, the lignin of which, according to Hilpert, is actually a secondary product resulting from carbohydrate material. The product obtained by Friese represented 8 per cent of a reddish-brown insoluble fraction, containing 48.9 per cent carbon, 5 per cent hydrogen, 3.5 per cent sulphur, 6.7 per cent methoxyl, and yielding 15 per cent acetic acid. When hydrolyzed with 10 per cent sulphuric acid, the material gave a carbohydrate fraction isolated as the acetate and a sulphonated lignin fraction. The acid reaction mixture was separated into 2 fractions, one soluble in chloroform (which gave a crystalline carbohydrate derivative) and an acid soluble fraction. After extraction with methanol, and the formation of a barium salt, this was submitted to ultrafiltration. The brown powder obtained in this way gave, on analysis, 43.0 per cent carbon, 4.3 per cent hydrogen, 5.6 per cent sulphur, 13.7 per cent barium and 12.5 per cent methoxyl.

These analytical data for the barium salt of sulphonated lignin are in substantial agreement with analogous products obtained by similar procedures from rye straw, spruce and pine. If the assumption is made that the sulphuric acid acts additively and not as an aromatic sulphonating agent, the common lignin formula is approximately $C_{36}H_{37}O_{13}$. A somewhat different lignin formula having a lower carbon and a higher oxygen content would result if ordinary sulphonation (of a nucleus) had taken place. The former hypothesis is in closer harmony with the experimental facts. More recent work (given in the 9th paper) furnishes evidence that lignin is probably not aromatic, at least a comprehensive series of experiments serve to show that no sulphonation or nitration take place on an aromatic (phenolic) nucleus. This more recent work involves a study of calcium lignosulphonates. The question raised was whether sulphuric in acetic anhydride-glacial acetic acid mixtures and calcium bisulphite (of sulphite cooking liquor) enter the lignin molecule at the same point or whether the sulphuric acid sulphonates a nucleus, whereas the bisulphite adds at a double bond. Lignosulphonic acid (A) isolated from waste sulphite liquors, was shown to contain 2 $SO_3H$ groups for every 55 carbon atoms. When this lignosulphonic acid is treated further with calcium bisulphite partial resinification occurs, some sulphur is liberated but no more sulphur dioxide enters the compound. When wood is treated with a mixture of sulphuric acid-acetic anhydride-acetic acid a lignosulphonic acid (B) results in which there are 2 $SO_3H$ groups per 36 carbon atoms. When the calcium salt of (A) was heated with the above sulphuric acid mixture, there was no appreciable fission of the product since practically no ultrafilterable substances were formed. This calcium salt, however, showed differences from the calcium salt of the original (A). In the case of the (A) salt the analytical data were as follows: 52.8 per cent carbon, 5.6 per cent hydrogen, 5.5 per cent sulphur, 3.15 per cent calcium; whereas for (C) the data were: 47.2 per cent carbon, 4.55 per cent hydrogen, 7.0 per cent sulphur and 4.5 per cent calcium. The increase in sulphur is accounted for by assuming that sulphite liquor does not saturate completely the double bonds of the lignin. When the barium salt of (B) was heated under pressure at 135 deg. C with calcium bisulphite, a product (D) resulted that showed no increase in sulphur and which had a composition very close to that of (C). On analysis (D) (which was slightly contaminated with the barium salt) gave: 47.0 per cent carbon, 4.2 per cent hydrogen, 6.9 per cent sulphur, and 6.0 per cent calcium (the latter figure being high). It appears therefore that $SO_2$ and sulphuric acid add at the same point of the lignin molecule, for if not one would expect further energetic sulphonation of an aromatic nucleus when (A) was converted into (C). This means that in the case of bisulphites and of sulphuric acid in acetic acid and acetic anhydride, addition probably takes place at a double bond.

In another experiment a non-ultrafilterable nitrolignin obtained from wood by nitric acid in acetic acid and anhydride was subjected to the same sulphuric acid treatment that was outlined above. No sulphuric acid was taken up and the assumption follows that the same part of the molecule that takes up sulphuric acid had taken up the nitric acid, i.e., that nitration and sulphonation of lignin occur at the same point. On the basis of these data, Friese concludes that there is no experimental evidence for an aromatic nucleus in lignin. Hermann Friese and hans Fürst, Berichte der Deutschen Chemischen Gesellschaft, 70B, 1463-73; Friese and Hanni Glassner, Ibid., 1473-7; Friese and Eberhard Clotofski, Ibid., 1986-9 (1937) through C. A. 31, 6869-70; 8917-8 (1937).

## ◆ Analyses of Buried Kauri Wood

Previous analyses of various woods buried below the earth's surface, carried out with the most varied technique, have usually led to the conclusion that with increasing age of the wood the cellulose content decreases and the lignin content increases. The theories for the explanation of these phenomena are various, but the facts remain. In New Zealand where the Kauri tree (Agathis australis, Salisb.) flourishes, there are areas in swampy ground, or sites that at one time were swamps, where entire Kauri forests have become submerged. In some cases the trees are buried 12 feet underground with a covering of peat from the forest and sometimes with ashes and charcoal. This Kauri swampwood may appear quite sound on superficial examination, and has been used for building purposes with questionable results. Its durability is considerably lower than that of fresh Kauri wood. In pulp manufacture the buried swamp wood gives much lower pulp yields than those obtained from recently felled trees. Extreme examples of the buried wood were examined chemically. One sample (A) from the Otahuhu region was found buried 11 feet underground, covered with 4 feet of peat, 7 feet of clay, while over this clay was a layer of lava. The estimated geological age of the wood was 20 thousand years and this is probably the oldest wood sample ever analyzed. The outer layer of the wood ($A_1$)

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was dark and decomposed. The inner part ($A_2$) on superficial examination seemed sound, but was darker than the original fresh wood and had a density of only 72 per cent and a tensile strength of only 30 per cent of fresh Kauri. A second sample (B) of buried wood taken near the sea (Takapuna) lay one foot under peat and sandy clay. This sample was black and evidently had suffered marked decomposition, probably due to salt water. Chemical analyses carried out in accordance with the procedure of the Forest Products Research Laboratory, Prices Risborough, England, led to the results given in the following table (given in per cent):

| | $A_1$ | $A_2$ | B | Fresh Kauri-wood |
|---|---|---|---|---|
| Moisture. | 15.08 | 17.43 | 26.35 | 9.85 |
| Ash ..... | 1.33 | 13.15 | 24.73 | 0.28 |
| Hot water extractives... | 1.72 | .... | .... | 7.18 |
| 1% NaOH extractives... | 12.07 | .... | .... | 20.85 |
| Pentosans | 6.21 | 4.48 | 0.0 | 8.61 |
| Methoxyl. | 6.91 | 5.85 | 0.0 | 4.25 |
| Lignin .. | 62.5 | 71.6 | 97.1 | 31.9 |
| Cellulose. | 30.4 | 19.0 | 2.4 | 53.8 |

(Abstractors note—The lignin and cellulose figures seem to be made on ash-free, moisture-free basis.)

From the above tabulated data, it is evident that with increasing degradation of the wood, the lignin increases at the expense of the cellulose. It is interesting to note the apparent absence of methoxyls in (B). F. P. Worley and S. G. Brooker. J. Soc. Chem. Industry (British), 56, 74 T (1937); through Papier-Fabr. 35 (Abstracts) 125-6 (1937).

## ◆ Alkali Solubility and the Rate of Beating Sulphite Pulp

The rate of hydration, and the strength of the resulting pulp is correlated with solubility in alkali. The pentosan content does not seem to influence the beating time or the maximum pulp strength. However, the higher the alkali soluble matter, the shorter the time of beating. The effect of mannans present was not determined. Alkaline solutions varying from 8-15 per cent were allowed to act on 4 samples of sulphite pulp. The maximum solubility (15.6 per cent) was reached in 9 per cent alkali. The author concludes that it is unsafe to make the generalization that hemicelluloses in the cell-walls shorten the beating time or increase the pulp strength. F. W. Klingstedt. Svensk-Papperstid. 40, 412-6 (1937); through C. A. 31,8920 (1937).

## ◆ Spruce Resin and Pitch Troubles

The following gives the abstracts of 2 papers. In the first, a chemical examination of spruce resin has been made. When freed from small amounts of terpenes, the resinous components yield a characteristic crystalline acid, $HOC_{19}H_28$ COOH (A) which in the original resin is probably admixed with neutral substances and with its lactone. (A) melts at 95-6 deg. C. Its lactone is sticky and so are the neutral phytosterols which accompany it. Evidently there is also an amorphous anhydride of (A), readily obtained from the latter and easily converted into (A). *(It is not quite clear in the abstract whether this is identical with the lactone or not—Abstractor).* This serves to differentiate (A) from other common resin acids. When spruce resin is treated with alcoholic KOH followed by dilution, evaporation to a syrup, and treatment with water, the potassium salt of (A) enters solution. The neutral substances may be extracted with ether, and this extract yields what appear to be largely phytosterols. (A) may be readily converted into the sticky lactone at 50-60 deg. C. *(This seems inconsistent with the above recorded melting point—Abstractor).* On alcoholic alkaline treatment, the lactone is reconverted into (A). Fatty acids play a minor role in the spruce resin. The sticky components may account for pitch troubles. O. Aschan. Pappers Trävarudtid. (Finland) Sondernummer 324-8; 436-8 (1937) through Papier Fabr. (Abstracts) 35,138 (1937).

The second paper indicates that the unsaponifiable components of coniferous woods, which seem largely responsible for pitch trouble, are autoxidizable, unsaturated diterpene alcohols formulated as $C_{20}H_{33}OH$. Evidence of the dangers residing in these substances is found in the work of Konopatskij, who ascribes their presence to wood which has not been stored long enough. They are also probably responsible for cymene found as by-product in the sulphite cook. The problem of rendering these substances harmless (as pitch producers) by some type of oxidation is discussed, but the difficulty is to insure their oxidation without having the oxidizing agent consumed by other pulp components. (The discussion following this second paper, by such experts as Hägglund, Brauns, Johansson, Malgren et al. is given in Svensk Pappersmasse Tidn. 14,106 (1937). The original 2nd paper is by Bror Holmberg Svensk Pappers-Tidn. 40, 180-2 (1937) through Papier-Fabr (Abstracts), 35, 140 (1937).

## ◆ Stabilizing Lignin Stains

The yellow coloration obtained by the action of aniline sulphate on thin sections of wood may be rendered fairly permanent by allowing the section to dry out, and then treat it with a drop of glacial acetic acid, allowing it to dry again, and finally mount under a cover glass sealing with Canada balsam. Coniferous woods retain their color for 18 months. Oak samples show a decrease in color after five months. The phloroglucinol reaction, which is usually fugitive, may be partly stabilized by treating (coniferous) wood sections with the reagent, allowing it to air dry, treating with glacial acetic acid, air-drying and sealing with Canada balsam. The red coloration lasted for one

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month without decrease in intensity, and could still be noted after six months. Oak lost its color almost completely after one month. All attempts to preserve the Mäule color reaction proved unsuccessful. Kurt Lohwag. Papier-Fabr. 35 (Tech Teil) 327-8 (1937).

## ◆ Thermal Effects in Beating Pulp

As the result of a recent publication (World's Paper Trade Rev., Feb. 19, 1937) which deals with defibration at various temperatures in a pebble mill, the present author is here presenting results of unpublished work carried out in the past

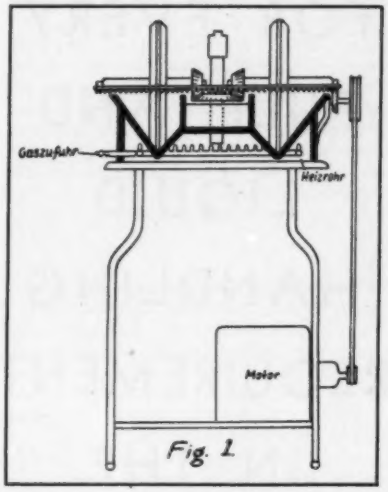


Fig. 1

with Drs. Max Hahn and Kurt Preiss. The experiments were run in a Clark kollergang (Figure 1) which was heated by a ring gas burner (the gas inlet being shown as Gaszufuhr in the cut). The contents of the kollergang, it was found, could be kept at constant temperature ranging up to 70 deg. C. Due to the open construction of the apparatus, the course of kollering could be observed progressively during an experiment. The stock used included 2 unbleached pulps, one very hard and the other very soft, and two bleached

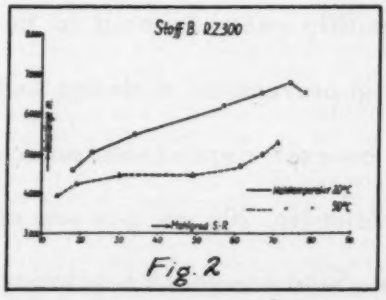


Fig. 2

pulps, one very resistant and the other very unresistant to beating. Irrespective of their previous history the pulps were beaten (kollered) at 20 and 50 deg. C. for periods extending from 12.5 to 250 minutes, at a stock density of 2.5 per cent. The Schopper Riegler degree of beating, the breaking length, the stretch, Mullen test, and parchmentizability as shown by the blister test (Cf. Technical Developments, THE PAPER INDUSTRY, Oct., 1934, p. 513) were determined in each case, and the detailed results are tabulated, and graphically reproduced.

Only a few of these graphs are given herewith, although the original article contains 15. For example Figure 2 shows the breaking length of the soft unbleached pulp strip (B—Reisslänge) as a function of the degree of beating (Mahlgrad), at the two temperatures. It is obvious here, as in all other graphs, that to reach a definite deg. S.R., the lower temperature gives the best results. In obtaining beating (kollering) temperature curves, 50 g. of dry pulp are made up to 2.5 per cent stock density in a British disintegrator operating for 25 minutes. The stock is brought to the desired temperature, and is then brought into the kollergang, the temperature of which has been raised or lowered to that of the pulp suspension. The author found that he could keep a kollering temperature within 0.5 deg. C. and ordinarily the temperatures used were 20, 30, 40, 50, 60, and 70 deg. C. The beating time was usually 50 minutes and the kollergang made 2,000 revolutions during that period. The series of graphs shown in Fig-

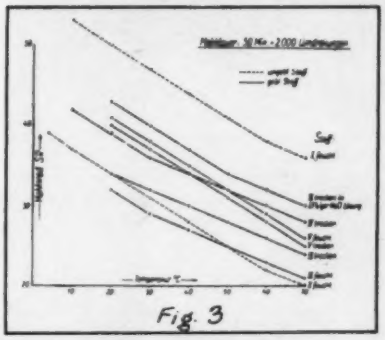


Fig. 3

ure 3 make it clear that under standardized conditions the S.R. deg. of beating is always greatest with the lowest temperature, and that it drops steadily with increasing temperatures. (In these graphs, bleached (Gebl. stoff) and unbleached (Ungebl.) pulps were used both moist (feucht) and dry (trockem) and in one instance (III) pulp treated with NaCl was used in the experiment). The so-called critical temperature of kollering is defined as that at which resin separates in the form of a reddish-brown ring on the sides of the kollergang. Before each experiment the kollergang, therefore, had to be cleaned thoroughly. Just as the degree of beating (kollering) decreases with rising temperature, so breaking length, stretch, pop-test, and parchmentizability fall as well. This is true for all the pulps under examination, and occurred quite irrespective of wide fluctuations in analytical data (e.g., wood-gum content, viscosity, etc.).

In order to arrive at a definite breaking length (as a single example) kollering at higher temperatures requires a longer time period and naturally involves a higher power consumption. Figure 4 shows the difference between a time-beating curve and a temperature beating curve. The beating temperatures (Mahltemperature) and the beating times are both shown on the horizontal axis. The breaking lengths are shown on the vertical axis. The relationship between beating temperatures and the resulting Mullen tests are shown graphically in Figure 5. At various temperatures the stock shows

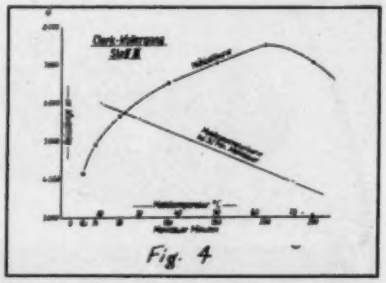


Fig. 4

varying swelling properties, and there is a direct correlation between the beating temperature and the surface tension of the liquid adsorbed. The temperature-beating curve of a pulp furnishes a new criterion for characterizing that pulp. This is a linear relationship which indicates that pulp strength is a function of the temperature with constant time of beating. These beating-temperature curves also indicate characteristic differences in physical properties of the different pulps. This is shown by the relative heights and slopes of the linear graphs above the temperature axis. (Figure 3, where the beating-temperature curves of the various pulps are given). An inter-

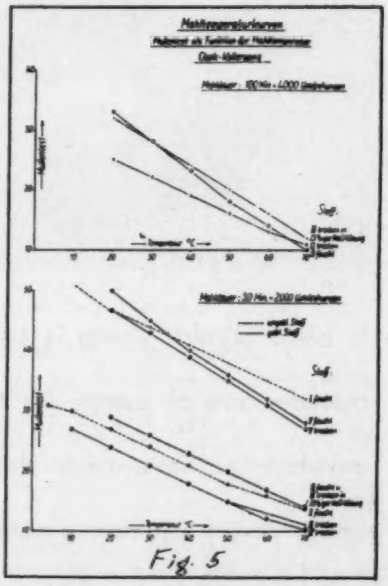
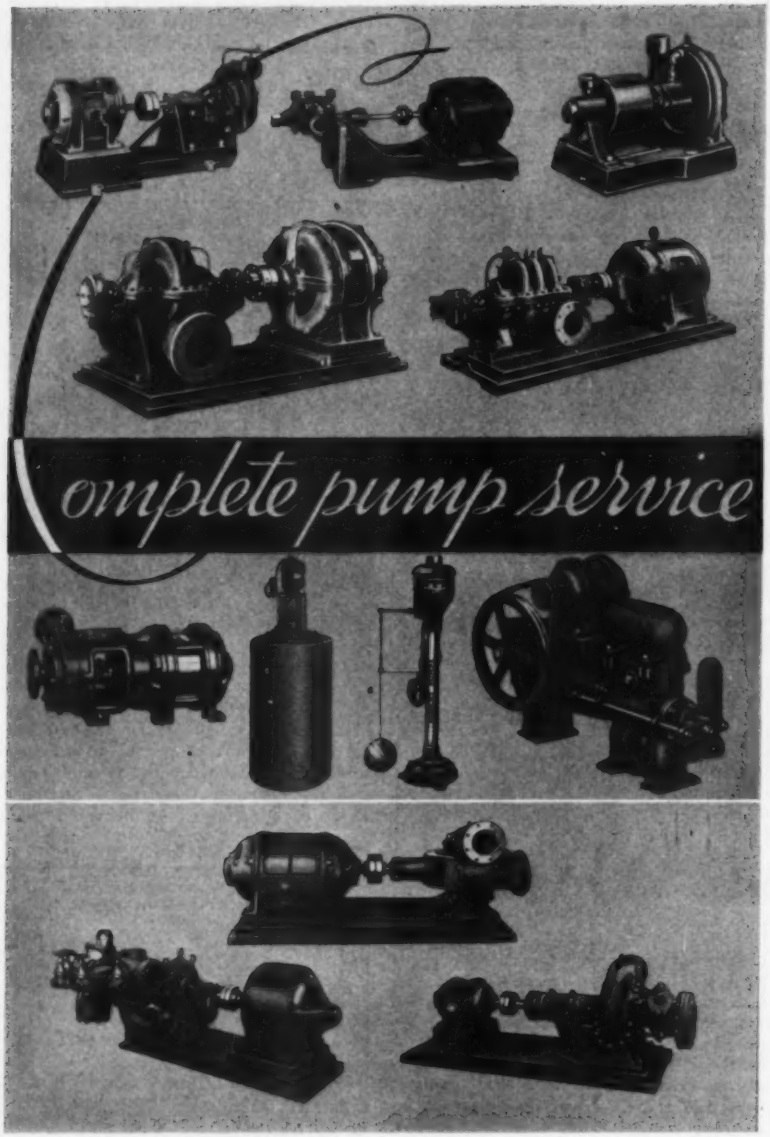


Fig. 5

esting by-product of the investigation is the critical (resin-separating) temperature described above. This tendency towards resin separation is not a special property of individual pulps but a general phenomenon which is evidently a function of the temperature of beating, and of the plasticity of the resin (rosin-fatty acid mixture) in the pulp. August Noll. Papier-Fabr. 35, 393-99; 401-8 (1937).

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# PAPERMAKING PATENTS

## IN THE UNITED STATES

Inquiries with reference to any of these patents should be addressed to James Atkins, Munsey Building, Washington, D. C.

Compiled by James Atkins, Registered Patent Attorney

**2,092,263—Pulp Stock Agitation.** John A. Rosmait, Manistee, Mich. Application May 31, 1935, Serial No. 24,265. 19 Claims. (Cl. 92—37). A storage chest for pulp stock and apparatus for agitating the pulp stock therein comprising, in combination, an elongate chest, a flow pipe extending substantially the length of the chest along its upper level and having its discharge end terminating in the chest, means for withdrawing pulp stock from the lower levels of the chest and delivering the same to the flow pipe to be discharged thereby into the chest, a deflector extending downwardly from the flow pipe intermediate the ends of the chest, and valve means for by-passing the contents of the flow tube downward upon said deflector.

**2,092,798—Process and Apparatus for the Manufacture of Paper.** Edgar Alexander Charlton, New York, N. Y., assignor to International Paper Company, New York, N. Y., a corporation of New York. Application December 17, 1934, Serial No. 757,765. 5 Claims. (Cl. 92—45). In a paper making machine, a paper making wire, rolls provided with vibratory devices located at spaced intervals under said wire and in contact therewith, and means to drive said rolls at differential speeds with respect to the speed of said wire.

**2,092,821 — Device for Continuously Beating Paper Pulp and the Like.** Wilhelm Thaler, Heidenheim-on-the-Brenz, Germany, assignor to American Voith Contact Co., Inc., New York, N. Y., a corporation of New York. Application January 18, 1935, Serial No. 2,437. In Germany January 19, 1934. 2 Claims. (Cl. 92—22). A device for continuously beating paper pulp and the like comprising a casing having an inlet at one end thereof for receiving a strip of pulp and an outlet at the other end for the passage therethrough of the pulp, a beating roll in said casing the axis of rotation of which is substantially perpendicular to the end walls of said casing, a bed plate in said casing cooperating with the beating roll, an abutment within said casing of a length substantially equal to the length of the beating roll, and an undivided compartment within the casing substantially the length of the beating roll, the end walls of which compartment are substantially parallel with each other and inclined in respect to the axis of the beating roll, portions of the end walls of the compartment contacting with the end walls of the casing, said compartment having an undivided intake and outlet extending the length thereof, said intake lying adjacent said abutment, said outlet lying adjacent to said bed plate, whereby the pulp strip entering the casing inlet after its partial convolution around the beating roll and along the inlet end wall of the casing, is given a helical-like path by said strip being deflected by the adjacent inclined wall of the compartment, said helical-like movement of the strip being maintained throughout the length of the compartment to its inclined outlet wall, the sides of said helical-like strip of pulp contacting each other, the body of pulp moving in helical-like strips and filling the length of the compartment between its end walls.

**2,092,862—Paper Machine Slitter Knife.** Albert John Thibedeau, Ottawa, Ontario, Canada. Original application July 5, 1934, Serial No. 733,777, Patent No. 2,043,818. Divided and this application August 20, 1935, Serial No. 37,017. 6 Claims. (Cl. 164—60). In a paper machine, a slitter mechanism comprising a plurality of slitter knives, means for adjusting the slitter knives at a fixed predetermined pressure, electrically operated means for shifting said knives laterally by remote control and releasing said electrically operated means and returning said slitter knives to operating position by the said means for adjusting the said slitter knives at a fixed predetermined pressure.

**2,092,966—Fibrous Sheeting and Process of Preparing the Same.** Joseph H. Gay, West Orange, and John A. Wilson, Elizabeth, N. J. Application November 22, 1934, Serial No. 754,340. 2 Claims. (Cl. 92—68). The process of making sheetings which process comprises subjecting a non-woven paper or felt-like porous fibrous sheet of flexibility suitable for rolling and of substantially uniform thickness throughout and of texture capable of being burnished when being cut, subjecting the sheet to a preparative treatment by moistening the sheet to condition it for a splitting treatment, and thereafter subjecting the sheet to the action of a traveling knife applied to the edge of the sheet, thus splitting the sheet into a plurality of thinner sheets and burnishing that face of each sheet next adjacent the knife.

**2,092,967 — Decorative Sheeting and Process of Preparing the Same.** Joseph H. Gay, West Orange, Ralph G. Jackson, Woodbury, and John A. Wilson, Elizabeth, N. J. Application December 22, 1934, Serial No. 758,868. 18 Claims. (Cl. 41—17). The process of making decorative sheetings, which process comprises applying decorative coloring matter in designs to the surface of a non-woven porous fibrous sheet, causing the coloring matter and the designs to penetrate substantially through the thickness of the sheet, splitting the colored sheet thus of uniform thickness throughout into a plurality of thinner sheets each of uniform thickness throughout and with regularity of surface and displaying identical decorative coloring and like surface characteristics on those faces which have resulted from the splitting action, and subjecting the split sheets to a saturating treatment in which substantially the entire thickness of the sheet is impregnated with a substantially transparent waterproofing agent.

**2,096,973—Method of Producing Paper Having a Mirror-Like Luster.** Carl Munch, Leipzig, Germany, assignor to Atlas-Ago, Chemische Fabrik Aktiengesellschaft, Molkau, near Leipzig, Germany, a company of Germany. Application May 11, 1935, Serial No. 20,919½. In Germany May 12, 1934. 4 Claims. (Cl. 91—70). The method of producing paper having a glossy surface and mirror-like luster which comprises polishing the surface of a paper sheet, forming a fusible cushioning and leveling intermediate layer on said sheet, said layer being constituted of a material containing at least one substance of the group consisting of waxes, resins, rubber, gelatin and glue, applying a top layer of cellulose ester on said intermediate layer and subsequently bringing the pretreated sheet in light and yielding contact with a surface having a mirror-like finish at a temperature at which said intermediate layer becomes pliable and conforms both to the irregular surface of said paper sheet and to the mirror-like surface of said roller whereby a smooth, mirror-like surface is imparted to said top layer and is permanently retained after cooling of said intermediate layer.

**2,096,976 — Paper Towel.** George A. Richter and Milton O. Schur, Berlin, N. H., assignors to Brown Company, Berlin, N. H., a corporation of Maine. Application December 12, 1931. Serial No. 580,734. 4 Claims. (Cl. 92—68). A process which comprises treating an absorptive paper web consisting substantially entirely of cellulose with formaldehyde solution, then treating the web with a strong solution of mineral acid for a period of time controlled to permit such acid to hydrate the cellulose and thereby increase markedly the wet-strength of the web while its water-holding capacity is preserved substantially unimpaired, washing the web, and drying it.

**2,097,121—Process for Prevention and Removal of Foam in the Manufacture of Paper.** Richard Fromm, Hamburg, Germany, assignor to Lehmann & Voss &

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**LOVE BROS., Inc. AURORA, ILL.**

Company, Hamburg, Germany. Application June 17, 1936. Serial No. 85,806. In Germany June 26, 1935. 4 Claims. (Cl. 92—21). A process for preventing or removing foam during the manufacture of paper, which comprises, introducing a material consisting essentially of a phosphatide to the aqueous suspension of fibrous material, and thereby preventing or removing foam.

2,097,299—**Twisted Paper Cord.** John E. Millett, Chelsea, Mich., assignor to Grand Rapids Fibre Cord Company, Grand Rapids, Mich., a corporation of Michigan. Application August 17, 1935. Serial No. 36,668. 3 Claims. (Cl. 117—60). A high breaking strength round twisted paper cord consisting of a paper ribbon having its edge portions folded over, once only, on the same face of the ribbon with the edge portions in closely confronting relation at the middle of the ribbon and the ribbon folded lengthwise in its middle portion to form a solid four ply, only, cord of approximately circular cross-section, thereby disposing the infolded edge portions inside the cord and substantially together with the edges thereof terminated in the bottom of the middle fold, the cord being twisted.

2,097,601—**Method and Apparatus for Coating Paper and the Like.** Adolph Potdevin, Garden City, N. Y., assignor to Potdevin Machine Company, Brooklyn, N. Y., a corporation of New York. Application June 1, 1935. Serial No. 24,474. 16 Claims. (Cl. 91—70). The method of coating paper and the like, which method comprises continuously moving a web of the material through a bath of coating material, advancing the web to a bath of cooling fluid to cool the coating and then moving the web between air streams directed alternately first against one side and then against the other side to vibrate the web to remove excess cooling fluid and dry the coated web.

2,098,222—**Method of Making Cement or Bonding Material.** Philip S. Barnhart, Westfield, Mass., assignor to Westfield River Paper Company, Russell, Mass., a corporation of Massachusetts. Application January 15, 1936. Serial No. 59,309. 4 Claims. (Cl. 134—17). A method of compounding a cement or bonding material having as ingredients wax, rosin, rubber and petrolatum which consists of softening the rubber by a pressing and kneading action, adding petrolatum to the rubber and heating and thoroughly intermixing the rubber and petrolatum mixture and then adding the mixture to melted paraffin wax and petrolatum and adding rosin to said mixture.

2,098,223—**Laminated Sheet of Paper or Like Material.** Philip S. Barnhart, Westfield, Mass., assignor to Westfield River Paper Company, Russell, Mass., a corporation of Massachusetts. Application January 15, 1936. Serial No. 59,310. 4 Claims. (Cl. 154—50). A laminated paper sheet comprising a pair of sheets of glassine paper united by a binder composed of a mixture of paraffin wax having a melting point of approximately 155° F., rosin, rubber and petrolatum having a melting point of approximately 125° F., said ingredients being combined in the following approximate proportions, namely, wax 40-63%, rosin 20-45%, rubber 3-12% and petroleum 7-13%.

2,099,726—**Paper and Method of Making Same.** Lloyd L. Dodge, Rhinelander, Wis., assignor to Rhinelander Paper Company, Rhinelander, Wis., a corporation of Wisconsin. Application June 20, 1935. Serial No. 27,541. 3 Claims. (Cl. 92—40). In the method of making a waxed paper of enhanced transparency and pliability from relatively free, only partially hydrated paper stock by successively forming the stock into a paper web having its fibers lying largely in the machine direction, drying, moistening and super-calendering said web, the steps which comprise subjecting said web a plurality of times to treatment with wax; first applying an aqueous wax emulsion to said web during said drying step and thereafter completing the drying of said web; secondly, passing the once waxed and super-calendered web through a bath of molten wax, winding said waxed web into a roll and maintaining the same at a temperature above the fusing point of the wax for a short time, and thirdly passing said waxed web from said roll into a second molten wax bath to level off and smooth the surface of said waxed web.

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# The COMMERCIAL OUTLOOK

New York, January 3, 1938.

WITH the quietness of the holiday and year-end inventory season added to the general dullness of the situation, the market for paper and paper products has gone from bad to worse. The industry is in the throes of a very slack spell. Demand for paper, aggregately speaking, has dropped off figuratively to nothing, insofar as current buying is concerned. There is, of course, a certain amount of activity in the market based on deliveries against contracts and routine wants of consumers and converters, but buyers with very few exceptions have cut their operations in the market to the proverbial bone and are absorbing exceedingly slim supplies of paper and board.

The result is, obviously, that paper manufacturers have been forced to greatly curtail production, and mills within the industry are running on seriously shortened schedules. Output is down to the lowest level witnessed in a long while, and when one stops to recollect the active condition of the industry a few months ago, it scarcely seems possible that the situation could have undergone so complete a reversal in such a comparatively brief period.

With a new year breaking, there is as usual an improved sentiment in industrial and trade circles. A majority within the paper industry are of the opinion that the present recession has spent its worse; that business is due to snap out of this most unfavorable situation sooner and quicker than was believed only a short while ago.

That the backward reaction in business has been sharp, there is no question. The index of industry in general in the United States has now dropped to a point where it shows an equal recession for the similar space of time back in 1929. Yet few there are who understand the prevailing depression, or who will venture an explanation for it. The feeling is common that no fundamental reason or reasons exist for it. Like Topsy, it just was born and grew. Consequently, the belief is increasing that it will not last, at any rate not for an appreciable period.

Paper manufacturers anticipate an upturn in buying before the present month of January is over. Their contention is that with purchasing at a bare minimum during the past two or three months, stocks in the hands of consumers, converters and distributors must be substantially reduced, and the fact that nearly all of the orders now reaching the market are of rush variety supports this belief. Production of paper has been curtailed drastically, and is now running about 35 per cent below the level of a year ago at this time. Mill output has held sharply below the preceding year's rate throughout all of the final quarter of 1937, and with consumers' inventories believed well liquidated, it is expected buying will have to increase from sheer necessity.

Figures relating to paperboard output in the U. S. Census Bureau's summary for November disclose how tremendously manufacturing operations within the industry have been curtailed. Mills of the country produced 267,567 tons of board during November, the lowest level of output since July, 1935, or very nearly two and a half years, and showing sharp reductions from 334,619 tons manufactured in the month preceding and 321,624 tons in November, 1936. The November production of board was at 56 per cent of mills' rated capacity, comparing with 68.5 per cent in October last, and 92.7 per cent in April of last year. Board production during the first eleven months of 1937 totaled 4,044,452 tons, against 3,330,098 tons in the corresponding time of 1936, and 3,050,461 tons in 1935.

New orders received by board manufacturers in November called for a total of 254,781 tons of board, contrasted with 315,122 tons in the month preceding and 308,732 tons in the same 1936 month. Unfilled orders held by mills at the end of November were for a total of 74,173 tons of board, against 88,775 tons a month before and 127,193 tons on the similar date a year previously.

The monthly index of newspaper advertising for November registered a decline of 7.5 per cent from the same month in 1936, and a drop of 3.8 per cent from the preceding month, according to Printers Ink. Magazine advertising increased 5.5 per cent over the same 1936 month and a similar advance over October last. Farm paper advertising gained 7 per cent over November, 1936, and 20.5 per cent over October, 1937.

Only Canada of the three North American newsprint producing countries recorded an increase in output during November, and total production for the Continent rose only 3.8 per cent, against a 5.7 per cent gain for Canada. Shipments during November ran far ahead of production, and mill stocks dropped precipitately during the month, showing a net reduction of 37,170 tons as compared with the total at the end of October, according to figures reported by the News Print Service Bureau.

Canadian output of newsprint was 302,236 tons in November, against 285,771 tons a year before, an increase of 16,465 tons or 5.7 per cent. Shipments by Canadian mills were 335,777 tons in November. United States output was 79,338 tons, against 79,853 tons in the same 1936 month, and shipments were 82,967 tons. Newfoundland produced 27,342 tons of newsprint in November, compared with 28,201 tons in November, 1936. Total North American production was 408,817 tons, against 393,825 tons in November, 1936.

At the end of November stocks of newsprint at Canadian mills were 47,772 tons, against 81,317 tons a month earlier and 52,135 tons at the end of November, 1936. United States mill stocks were 24,064 tons at the close of November, contrasted with 27,692 tons on October 31 last and 16,032 tons on November 30, 1936. Stocks at mills in both countries were 71,836 tons at the end of November, against 109,009 tons a month before and 68,167 tons a year previously.

Shipments of prepared roofing from producing mills in the United States reached a total of 3,014,217 squares in October, according to the monthly report of the Census Bureau, compared with 3,368,391 squares in the month preceding and 3,994,579 squares in the similar 1936 month. Ten-month shipments in 1937 aggregated 26,730,424 squares, against 28,182,861 squares in the corresponding period of 1936 and 22,967,604 squares in the first ten months of 1935.

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### ◆ New IPI Color Calendar Guide to Color Harmony

Appropriate color combinations for each month in the year with suggestions on how to use them most effectively, is the feature of the new Color Calendar distributed by the International Printing Ink Corp., New York City.

The first pages in the calendar tell how to choose colors according to the complementary, neighboring and triad principles. Instructions are given on using the color calendar sheets to get the greatest number of color schemes. The pages carry enough different color steppings to make 2500 two-color combinations or 60,000 three-color selections. The sheets are notched so they may be detached and replaced easily, facilitating the combination of various related color groupings.

The IPI Color Calendar was designed for printers, lithographers, advertisers, packagers, artists and others who use color daily and combines the general utility of a calendar with the functions of a guide to color harmonies.

### ◆ Walter R. Hicks

Walter R. Hicks, president of Daniel M. Hicks, Inc, New York City, dealers in supplies for paper and textile mills, passed away December 5 at the age of 53. Mr. Hicks, who was permanently blinded thirty-nine years ago, joined his father's concern in 1908 and in 1919, when Daniel M. Hicks died, he became president of the company. Mr. Hicks is survived by his widow, a son and two daughters.

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# Domestic RAW MATERIALS

## ◆ Chemical Pulp

Without question, the important development in papermaking raw materials recently is the announcement by domestic wood pulp producers of reductions of $10 and $7 per ton in quotations on chemical pulp to contract customers for first quarter of 1938 deliveries. The new contract basis on domestic bleached sulphite is 3 cents per pound or $60 a ton ex dock New York or other American Atlantic ports, as compared with 3.50 cents for the fourth quarter of 1937, a decrease of $10 a ton. Unbleached sulphite is lowered $7 a ton to 2.50 cents a pound or $50 per ton, also ex dock American Atlantic seaboard, contrasted with 2.85 cents for the last three months of 1937, and domestic bleached soda pulp is reduced $7 a ton to 2.90 cents a pound delivered paper mills, as against 3.25 cents for the final quarter of 1937.

These comparatively sharp slashes in prices by domestic pulp manufacturers came as something of a surprise in the trade, particularly since prior rumors indicated that the reductions would not exceed $5 a ton. Following the announcement of the new price levels for first quarter contract deliveries, it was learned that the domestic producers purposely cut prices as deeply as they did with an avowed purpose in mind of establishing a new and lower market level for chemical pulp in which consumers would have confidence and which would stabilize a market which had displayed such definite declining tendencies.

With prices lowered to virtually the levels of six months ago, or before the last two advances put into effect in the final two quarters of 1937, which it was appreciated were never offset by a proportionate rise in market prices of paper, pulp manufacturers express the hope that consumers will regain confidence in the domestic pulp price situation and proceed to contract against forward requirements in a normal manner. Reaction among pulp users to the new prices has been most favorable, it is said, the feeling within the industry being that chemical pulp prices will settle at the levels promulgated by domestic producers for first quarter contracts, and there will not be the hesitancy to buy that has been evinced in recent months.

## ◆ Papermaking Rags

About the best that can be said concerning the market situation in papermaking rags is that prices on most grades of rags apparently have steadied, even though purchasing by paper manufacturers is at a low ebb decidedly. Indications are that rag dealers and importers, having reached a conclusion that prices have moved low enough and that the tighter supply condition brought about by the fall in market values sooner or later is going to promote a strengthening of prices, are not so eager to sell and are playing more of a waiting game while having regained some of their confidence in the market's prospects. Thus, the pressure is off prices, and while no advancement has been scored, there is a distinctly steadier undertone and the further recessions recorded have been of rather slight dimensions.

New cuttings are held with more firmness by dealers, who stress that incoming supplies have decreased appreciably as producing factories have gradually curtailed apparel manufacturing operations. Dealers in New York ask 7.25 cents a pound f.o.b. that city, or certainly no lower than 7.50 cents delivered mills, for No. 1 white shirt cuttings, and it is questioned whether these rags could be bought under this price level. New soft unbleached muslins are quoted at 7 cents at dealers' shipping points, light silesias at 5.25 cents, new blue overall cuttings at 6.25 cents, bleached canton flannels at 6.75 cents, light flannelettes at 6 cents, fancy shirt cuttings at 2.75 to 3 cents, and washables at 2.50 cents.

Roofing rags have held notably steady on a price basis of 1.10 cents per pound for No. 1 domestic and 80 cents per hundred pounds for No. 2 domestic f.o.b. shipping points in the East, and reports assert that some felt mills are readily absorbing all the supply they can secure at these prices but that dealers are in many instances refusing to sell at such levels. Foreign roofing rags are nominally 1.50 cents a pound for dark colored cottons and 1.90 cents for linsey garments ex dock American Atlantic ports. There is practically no demand from paper manufacturers for old white cottons and thirds and blues, and prices of these rags are strictly nominal.

## ◆ Rope and Bagging

Only one adjective accurately describes the market for old rope—dormant. There is virtually nothing at all stirring in the trade in this papermaking material. Consuming mills are said to be well supplied and are scarcely inclined to augment their stocks. Nominally a price basis of 3 cents per pound f.o.b. shipping points prevails on No. 1 domestic old manila rope, while the reported price range on foreign old manila is 2.75 to 3 cents a pound ex dock U. S. Atlantic ports. Old bagging also is in a very quiet market position. Few paper manufacturers are buying, and the restricted movement of supplies is mainly to shredders or southern respinners. No. 1 domestic scrap burlap for papermaking probably could be bought at 1.75 cents a pound, perhaps less, at dealers' shipping points.

## ◆ Old Paper

With consuming mills, board plants in particular, heavily stocked and engaging in very light purchasing, waste paper has been in the doldrums and prices of some grades in some centers have fallen to the lowest levels known in years. Mixed paper of No. 1 quality, by way of example, is down to 12½ cents per hundred pounds in the East, f.o.b. New York. Heavy No. 1 old books and magazines are down to 50 cents per hundred pounds f.o.b. New York, old corrugated boxes to 25 cents a hundred pounds, and No. 1 old kraft paper to 65-70 cents a hundred. It can be said, however, that the market has developed a firmer undertone and that sellers are presenting greater resistance to these low prices, believing an upward trend soon will set in.

Folded newspapers are relatively firm, owing in part to their movement into consumption other than in board or paper mills, and are bringing 30 cents per hundred pounds in the East f.o.b. New York. No. 1 hard white envelope cuttings are quoted at 2.30 cents a pound at shipping points, No. 1 hard white shavings at 2 cents for ordinary packing and No. 1 soft white shavings at 1.60 cents for ordinary up to 2.10 cents for one-cut packing. A feature is that buying inquiry from Europe for waste paper for shipment from U. S. Atlantic ports is fairly brisk, although it is admitted a lack of ship space has put a decided check on exportations.

## ◆ Mechanical Pulp

Importers and mill agents agree that a very quiet market exists for mechanical pulp. Consumers are getting along with contract supplies or stocks in hand, and are resorting to almost no buying in the open market currently. Prices have softened to where domestic and Canadian prime moist groundwood is offered at $35 per short ton delivered consuming points in northern United States, or $30 ex dock American Atlantic seaboard. However, it is not a matter of price at present, consumers simply do not need pulp and are not disposed to acquire supplies.

## ◆ Pulpwood

All reports indicate there will be heavy cuts of pulpwood this coming winter notwithstanding the quiet market now prevailing and which has been seen for some time. Contract movement constitutes the principal activity in pulpwood at present. Quoted prices are maintained, showing no definite change.

## ◆ Chemicals

The contract season has arrived for papermaking chemicals, and buying has been reported cautious. Prices show few important changes. Caustic soda is 2.10 cents a pound for the solid product f.o.b. works, and soda ash 1.05 cents in bags at works. Bleaching powder holds to a quotable range of 2 to 2.25 cents per pound in drums at works.

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# Import and Export MARKETS

## IMPORTS

### ◆ Wood Pulp

Visible improvement is lacking, from a demand standpoint, in imported wood pulp, the market ruling very quiet, as it has for a considerable period. Not only are paper and board manufacturers not engaging in purchases of pulp, but in frequent instances they are asking to have shipments against contracts deferred; moreover, it is nothing unusual for consumers to offer for resale some of the pulp received from abroad. Not a great deal of reselling is going on, however, largely for the reason buyers are difficult to find. Nearly all paper and board manufacturers are in the same boat, which is to say they have more pulp on hand or on order than their present and near prospective requirements call for.

As regards prices, now that domestic sulphite manufacturers have reduced quotations to contract customers fairly drastically for the first quarter of 1938, or $10 a ton on bleached sulphite to a basis of $60 per short ton ex dock American Atlantic seaboard and $7 a ton on unbleached sulphite to a basis of $50, it would appear as if the next move is up to the foreign pulp producers. Thus far, quoted rates from Scandinavia and elsewhere in Europe have been well sustained on sulphite pulps, and even now producers on the other side of the Atlantic evince little or no disposition to lower quotable levels. The reason for this, apparently, is that pulp prices are holding up in other consuming countries and Scandinavian producers cannot understand why the market in America has weakened to the degree that it has. However, it scarcely seems logical for European producers to expect to secure prices for their pulps so far in excess of market levels here based on the reduced quotations of domestic manufacturers in contract channels.

Meantime, quotations on foreign prime bleached sulphite for shipment from primary sources abroad to the United States range from 4.50 cents a pound upwards ex dock American Atlantic ports, and on prime strong unbleached sulphite around 3.50 cents per pound. Scandinavian prime kraft pulp is nominally 3 cents to higher a pound for forward shipment from abroad on an ex dock basis here. At resale, imported pulp is reported available on spot in this country at 3.75 cents for prime bleached, 2.75 cents for unbleached sulphite and 2.50 cents for prime kraft, maybe at below these prices in exceptional cases. So little actual buying is being done that the market is not being fairly tested.

Wood pulp imports into the United States were fairly heavy during October, reaching a total of 184,074 short tons of 2,000 pounds, air dry weight, of chemical grades of a declared value of $8,240,974' according to U. S. Commerce Department figures, compared with 187,241 short tons valued at $8,434,951 in September last, and 179,718 short tons valued at $6,949,-878 in October, 1936. The October importations brought the aggregate for the first ten months of 1937 up to 1,826,523 short tons, constituting an increase of 146,090 tons or 8.6 per cent above a total of 1,680,433 short tons in the corresponding time in 1936.

Mechanical pulp imports in October amounted to 17,732 short tons of a value of $389,737, making a total for the first ten months of last year of 183,181 short tons, against 180,131 short tons in the similar 1936 period.

### ◆ Paper Stock

Imports of all paper base stocks into the United States in October last, including wood pulp and pulpwood, declined in total value 2 per cent from $10,739,000 in the preceding month to $10,574,000. All classes of wood pulp except sulphite showed gains ranging from 12 per cent to 1,293 per cent in the case of bleached mechanical pulp, the U. S. Department of Commerce reports. Rags for papermaking gained 19 per cent, reaching a total of 18,054,497 pounds of a declared value of $339,060 in October, and making a total for the first ten months of 1937 of 216,244,474 pounds of a value of $3,971,-588, as compared with 240,378,914 pounds valued at $3,929,464 in the first ten months of 1936. Miscellaneous paper stock imports in October were 9,166,683 pounds valued at $184,610, bringing the total for the first ten months of last year up to 102,822,374 pounds of a value of $2,402,390, against 86,098,680 pounds of a value of $1,510,534 in the similar 1936 period.

### ◆ Paper

Imports of paper into the United States in October were valued at a total of $12,535,467, contrasted with $10,453,967 in the same 1936 month, and making a grand total for the first ten months of 1937 of $112,496,969, against $89,301,904 in the corresponding time of 1936, according to U. S. Commerce Department statistics. Standard newsprint of course comprised the great bulk of these imports, receipts of this class of paper being valued at $100,229,112 in ten months last year, against $78,016,595 in the same 1936 period. Imports of greaseproof and waterproof paper declined 46 per cent in October compared with the month preceding, kraft wrapping dropped 29 per cent, paperboard and pulpboard decreased 14 per cent while pulpboard in rolls rose 21 per cent from 1,685,000 to 2,037,000 pounds.

## EXPORTS

Exports of paper and paper products from the United States during October last registered a gain of 5 per cent in total value as compared with the preceding month, reaching a value of $2,630,632, against $2,441,824 in September, and scoring a larger rise over exports valued at $1,986,246 in October, 1936, according to data issued by the U. S. Department of Commerce. Exportations in the first ten months of 1937 were valued at $25,-914,360, contrasted with shipments out of the country valued at $18,736,629 in the similar time in 1936.

Boxboard exports showed a substantial gain of 52 per cent in October, rising from 3,843,000 pounds in September last to 5,842,000 pounds in October. Fibre insulating board registered a like gain of 32 per cent, reaching 6,569,000 square feet during October compared with 4,984,000 for the preceding month. This was an increase of 12 per cent over the corresponding month in 1936. Wallboard jumped 88 per cent from 806,000 to 1,516,000 square feet, and was a rise of 118 per cent over the same 1936 month. Exports of paper bags dropped 3 per cent, and all wrapping paper except kraft showed a 28 per cent loss, from 2,774,000 to 2,000,000 pounds, while newsprint exports decreased 18 per cent. Although overissue and old newspapers receded 31 per cent, uncoated book paper gained 6 per cent over September and 12 per cent over the similar month in 1936. Sheathing and building paper registered the largest single gain in the major class, jumping 166 per cent from 635,000 pounds in September to 1,692,000 pounds in October.

Pulpwood exports during October rose 418 per cent over the month before, from 807 to 4,178 cords. This was a gain of 516 per cent over October a year previously. Wood pulp exports declined 17 per cent, but showed a rise of 62 per cent over the same 1936 month. Total exports of paper base stocks from the United States in October were valued at $2,160,-725, bringing the aggregate for the first ten months of 1937 up to $18,197,529, compared with shipments valued at $10,-416,916 in the corresponding period of 1936. Bleached sulphite pulp comprised the most important item in this group, with exports valued at $11,038,555 in ten months last year, against $7,035,621 in 1936.

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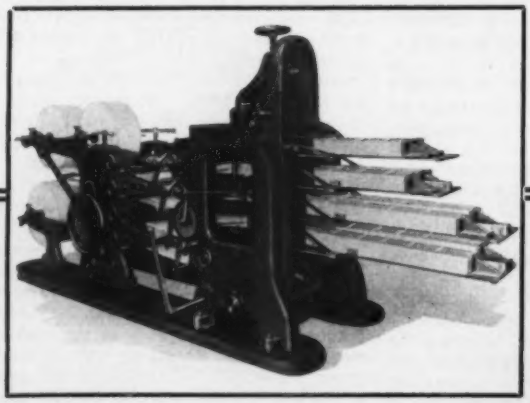

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